SONY

CCD COLOR CAMERA MODULE

XC-711/711P

JUNCTION BOX

JB-77

STANDARD LENS

VCL-16Y-M

4-PIN M CONNECTOR

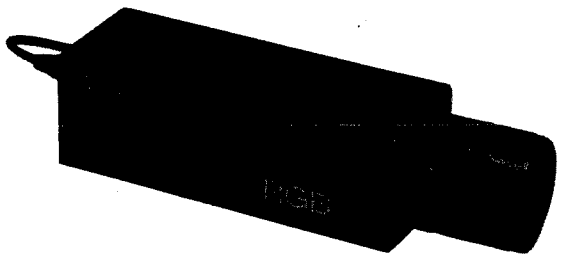
PC-XC04

12-PIN F CONNECTOR

PC-XC12

CAMERA CABLE

CCXC-12P02/12P05
CCXC-12P10/12P25
CCXC-9DB
CCXC-9DD



SERVICE MANUAL

XCM-711

For the customers in the USA

WARNING

To prevent fire or shock hazard, do not expose the unit to rain or moisture.

To avoid electrical shock, do not open the cabinet. Refer servicing to qualified personnel only.

WARNING

This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instructions manual, may cause interference to radio communications. It has been tested and found to comply with the limits for Class A computing devices pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment.
Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

The shielded interface cable recommended in this manual must be used with this equipment in order to comply with the limits for a computing device pursuant to Subpart J of Part 15 of FCC rules.

For the customers in Canada
This apparatus complies with the Class A limits for radio noise emissions set out in radio interference regulations.

Pour les utilisateurs au Canada
Cet appareil est conforme aux normes Classe A, pour bruits radioélectriques.
Tel que spécifiér dans le règlement sur le brouillage radioélectrique.

Bescheinigung des Herstellers
Hiermit wird bescheinigt, daß die Farb-Videokamera XC-711P in Übereinstimmung mit den Bestimmungen der Amtsblattverfügung Nr. 1046/1984 funkentstört ist. Der Deutschen Bundespost wurde das Inverkehrbringen dieses Gerätes angezeigt und die Berechtigung zur Überprüfung der Serie auf Einhaltung der Bestimmungen eingeräumt.
Sony Corporation

Hinweis
Gemäß dem Amtsblatt des Bundesministers für das Post-und Fernmeldewesen Nr. 163/1984 wird der Betreiber darauf aufmerksam gemacht, daß die von ihm mit diesem Gerät zusammengestellte Anlage auch den technischen Bestimmungen dieses Amtsblattes genügen muß.

Note
This appliance conforms with EEC Directives 76/889 and 82/499 regarding interference suppression.

Remarque
Cet appareil est conforme aux Directives 76/889 et 82/499 de la CEE en ce qui concerne la suppression des interférences.

Hinweis
Dieses Gerät erfüllt bezüglich Störstrahlungsunterdrückung die EEC-Richtlinien 76/889 und 82/499.

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第1章
取り扱い操作

1-1. 概要

XC-711(NTSCモデル)/XC-711P(PALモデル)は，CCD(Charge Coupled Device)撮像素子を使用したカラーカメラモジュールです。CCDの使用により，歪みのない画像を再生することができ，小型軽量で振動や衝撃に強い特性を持っています。XC-711/711Pは監視カメラとして，また画像処理システムの入力装置として最適です。

高解像度，忠実な色再現

768×493(XC-711)/756×581(XC-711P)画素の画面により，きめ細かな画像を再現します。
CCDには三原色方式を使用し，忠実な色を再現します。

RGB出力

コンポジットビデオ出力に加えてRGB出力を持つため，RGBモニターやTARGAボードなどの画像処理装置との接続が可能です。

多様な信号処理方法に対応

用途に応じて，GAINはAGC(Automatic Gain Control)と固定GAIN，γ補正はONとOFF，ホワイトバランスは自動調整とプリセットの選択が内部切り換えにより可能です。
また，内部切り換えでCCDの蓄積モードをフレームからフィールドに変更できるので，ノンインターレース方式の外部同期(HD, VD)信号を入力した場合でも，インターレース方式と同一の感度を得ることが可能です。

3種類の外部同期入力が可能

次の3種類の外部同期信号によって，ほかのカメラと同期させることができます。

HD，VD信号：HD(水平駆動)信号およびVD(垂直駆動)信号からインターレース方式かノンインターレース方式かを自動的に識別し，その方式に応じて外部同期をかけます。

S/VS/VBS信号：S(複合同期)信号，VS(映像/複合同期)信号，VBS(映像/バースト/複合同期)信号いずれかによって同期をかけます(HD, VD信号による同期方法とS/VS/VBS信号による同期方法は，入力同期信号に応じて自動的に切り換わります)。

リセットパルス：CCDの蓄積を任意のタイミングで行いたいとき，所定のリセットパルスを入力して、蓄積開始のタイミングを決めることができます。

内部同期信号出力

内部の同期信号発生部からクロック，HD，VDの各信号を出力して，接続した機器を本機に同期させることができます(設定には内部配線の切り換えが必要です)。

電子シャッター

電子シャッター機能を持ちます。シャッタースピードは，1/60，1/120，1/250，1/500，1/1000，1/2000，1/4000，1/10000秒のいずれかに設定することができます。また，シャッターをフリッカーレスモード(1/100または1/120秒)に設定して，蛍光灯などの照明で生じる画像のちらつきを防ぐことができます。

オートアイリスレンズに対応

レンズマウントは，標準Cマウントです。VCL-16Y-M標準レンズ(マニュアルアイリス)のほかに，VCL-08Y/VCL-16Yオートアイリスレンズを使用することができます。

堅牢な筐体

アルミダイキャストおよび鉄板で構成されています。筐体固定時に基準となる面にねじ穴が設けてあり，これを利用することにより光軸のずれを最小限にとどめることができます。

長寿命・高信頼性

画像ひずみが少なく，精度の高い画像

低残像で焼き付きのない，見やすい画像

優れた耐振動・衝撃性

クイックスタート

強磁界でも乱れない画像

低消費電力 5.5W

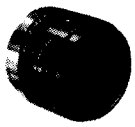
**GAINモードを「AUTO」あるいは，「FIX-6dB」に設定して、全面ハイライトの被写体を撮影すると，映像にフリッカーが発生することがあります。
この場合は，GAINモードを「FIX 0dB」，「FIX+6dB」，「FIX+12dB」のいずれかに再設定してから使用して下さい。**

1-2. 構成

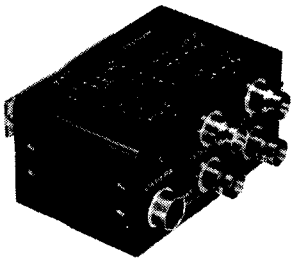
CCDカメラモジュールXC-711/711Pを中心としたシステムの構成は次の通りです。(それぞれが別売りになっています。)

CCDカメラモジュール
XC-711/711P

標準レンズ VCL-16Y-M



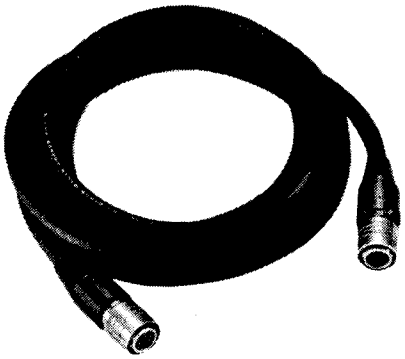
ジャンクションボックス JB-77



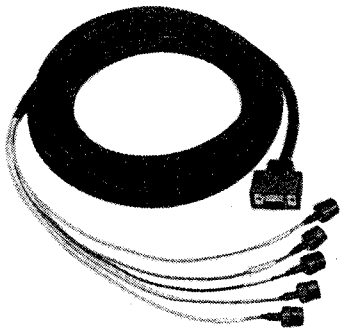
12ピンコネクターPC-XC12

4ピンコネクターPC-XC04

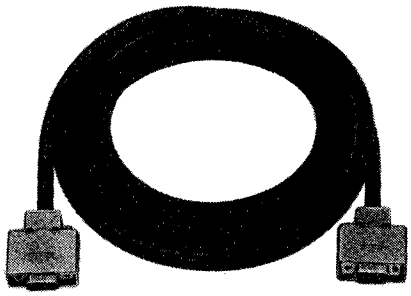
カメラケーブル
CCXC-12P02(2m)
CCXC-12P05(5m)
CCXC-12P10(10m)
CCXC-12P25(25m)



カメラケーブル CCXC-9DB



カメラケーブル CCXC-9DD



CCDカメラモジュールXC-711/711P

標準レンズVCL-16Y-M

f=16mm, F1.4の標準レンズで, 絞りとピント合わせは手動です。

ジャンクションボックスJB-77

カメラケーブルCCXC-12P02/12P05/12P10/12P25を使ってカメラモジュールと接続し, 電源の供給や映像信号の送出および外部同期信号の授受を行います。

12ピンコネクターPC-XC12

カメラモジュールのDC IN/VBS端子に接続するためのプラグで, システム用に準備されたものです。

4ピンコネクターPC-XC04

オートアイリスレンズのレンズコードをカメラモジュールのLENS端子に接続するために使用します。

カメラケーブルCCXC-12P02(2m)/12P05(5m)/12P10(10m)/12P25(25m)

カメラモジュール裏面のDC IN/VBS端子に接続し, 電源の供給や映像信号の送出および同期信号の授受を行います。

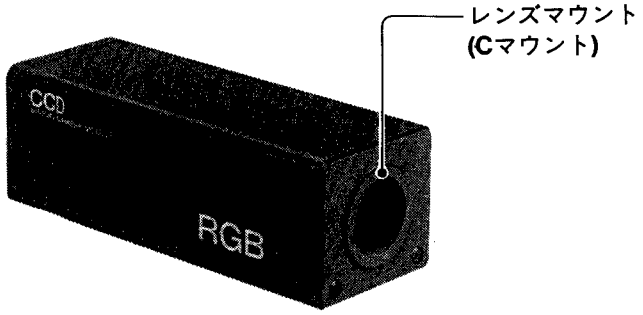
カメラケーブルCCXC-9DD(DSUB-DSUB)
CCXC-9DB(DSUB-BNC)

カメラモジュール裏面のRGB/SYNC/YC端子に接続し, RGB入力を持つ画像処理装置やモニターなどにRGB, シンク, VBS(またはY/C)信号を送ります。DSUB 9ピン入力端子を持つ機器との接続にはCCXC-9DDを使用し, BNC型入力端子をもつ機器との接続にはCCXC-9DBを使用します。

1-3. 各部の名称と使い方

1-3-1. CCDカメラモジュールXC-711/711P

前面

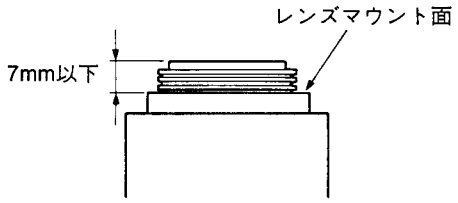


レンズマウント(Cマウント)

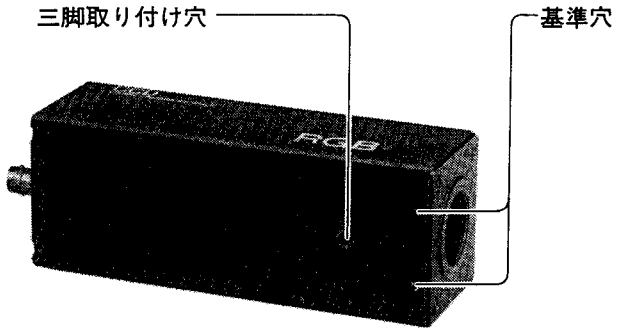
標準レンズVCL-16Y-Mなど，Cマウント式のレンズや光学機器を取り付けます。

ご注意

Cマウント式のレンズは，レンズマウント面からの突き出し量が7mm以下のものを使用してください。



底面



基準穴

カメラモジュール固定用に高い精度で切られたねじ穴です。ここでモジュールを固定すると，光軸のずれを最小限にとどめることができます。

寸法など詳しくは第2章をご覧ください。

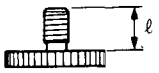
三脚取り付け穴

カメラモジュールを三脚に取り付けるためのねじ穴です(U¼-山20)。

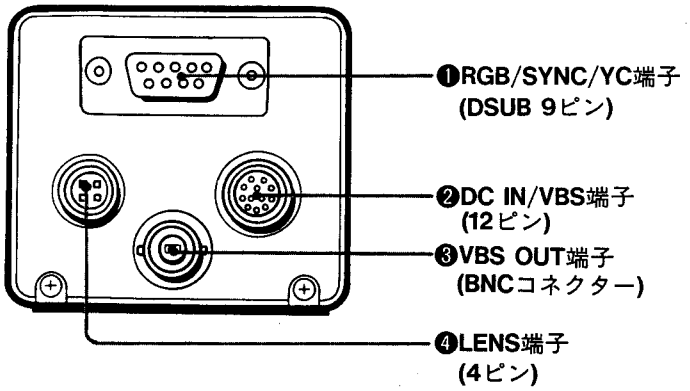
三脚の取り付けには次の規格のねじを使用してください。

ISO規格　ℓ ＝4.5mm ± 0.2mm

ASA規格　ℓ ＝0.197インチ



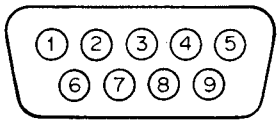
裏面



❶RGB/SYNC/YC端子(DSUB 9ピンコネクター)

RGB, シンク, VBS(またはY/C)信号を出力します。カメラケーブルCCXC-9DD(DSUB-DSUB)またはCCXC-9DB(DSUB-BNC)を使用して, RGBモニターや画像処理装置と接続します。

この端子のピン配列は下図の通りです。



ピン番号	同期方法	
	内部同期	外部同期
1	アース	アース
2	アース	アース
3	R出力	R出力
4*	G出力	G出力
5	B出力	B出力
6**	VBS出力[1)]	Y出力(NTSC)[1)] VBS出力(PAL)[1)]
7***	シンク出力	シンク出力
8	アース	アース
9****	アース	アース

1) γ補正がONのときの出力信号。γ補正がOFFのときは、Y_L信号を出力します。

カメラ内部の配線を変更することにより、ピン出力を以下のように変えることができます。

* ピン4から出力するG信号に、シンクを加えることができます。

** γ補正がONのときに、ピン6の出力を同期モードに関わりなくY信号にすることができます。(γ補正がOFFのときはY_L出力。)

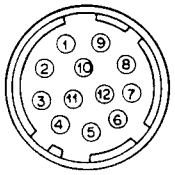
*** ピン7から出力されるシンクのレベル(工場出荷時は0.3Vp-p)を2.0Vp-pに変えることができます。

**** 内部同期モードかつγ補正がONのとき、ピン9の出力をクロマ信号にすることができます。
(XC-711Pでは、外部同期モードでも可能です。)

❷DC IN/VBS(DC電源入力/VBS信号)端子(12ピン)

カメラケーブルCCXC-12P02/12P05/12P10/12P25を接続し，DC＋12Vの電源の供給を受けるとともにカメラモジュールからの映像信号を出力します。また，同期信号発生器を接続して外部同期信号(S/VS/VBSまたはHD，VD)を入力すると，カメラモジュールを外部同期で動作させることができます。

この端子のピン配置は下図のとおりです。



ピン番号	外部同期モード			内部同期モード
	HD，VD	S/VS/VBS	RESTART RESET	CAMERA 同期信号
1	アース	アース	アース	アース
2	＋12V	＋12V	＋12V	＋12V
3	映像出力(アース)＊	映像出力(アース)＊	映像出力(アース)＊	映像出力(アース)＊
4	映像出力(信号)＊	映像出力(信号)＊	映像出力(信号)＊	映像出力(信号)＊
5	HD入力(アース)	——	HD入力(アース)	HD出力(アース)
6	HD入力(信号)	——	HD入力(信号)	HD出力(信号)
7	VD入力(信号)	S/VS/VBS(信号)	RESET PULSE(信号)	VD出力(信号)
8	——	——	——	CLOCK出力(アース)
9	——	——	——	CLOCK出力(信号)
10	アース	アース	——	アース
11	＋12V	＋12V	——	＋12V
12	VD入力(アース)	S/VS/VBS(アース)	RESET PULSE(アース)	VD出力(アース)

＊：γ補正がONのとき——VBS出力。
　γ補正がOFFのとき——Y_L出力。

❸VBS OUT(映像出力)端子(BNCコネクター)

カメラモジュールからの映像信号を出力します。DC IN/VBS端子にカメラケーブルCCXC-12P02を接続した場合で，CCXC-12P02の12ピンコネクターの映像出力を75Ω終端しない場合にのみ，この端子を使用できます。

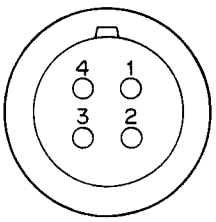
この端子から出力される信号は以下の通りです。

γ：ON		γ：OFF
内部同期	外部同期	
VBS出力	Y出力(NTSC) VBS出力(PAL)	Y_L出力

❹LENS(レンズ)端子(4ピン)

オートアイリスレンズのプラグを接続すると，レンズの絞りを自動調整することができます。

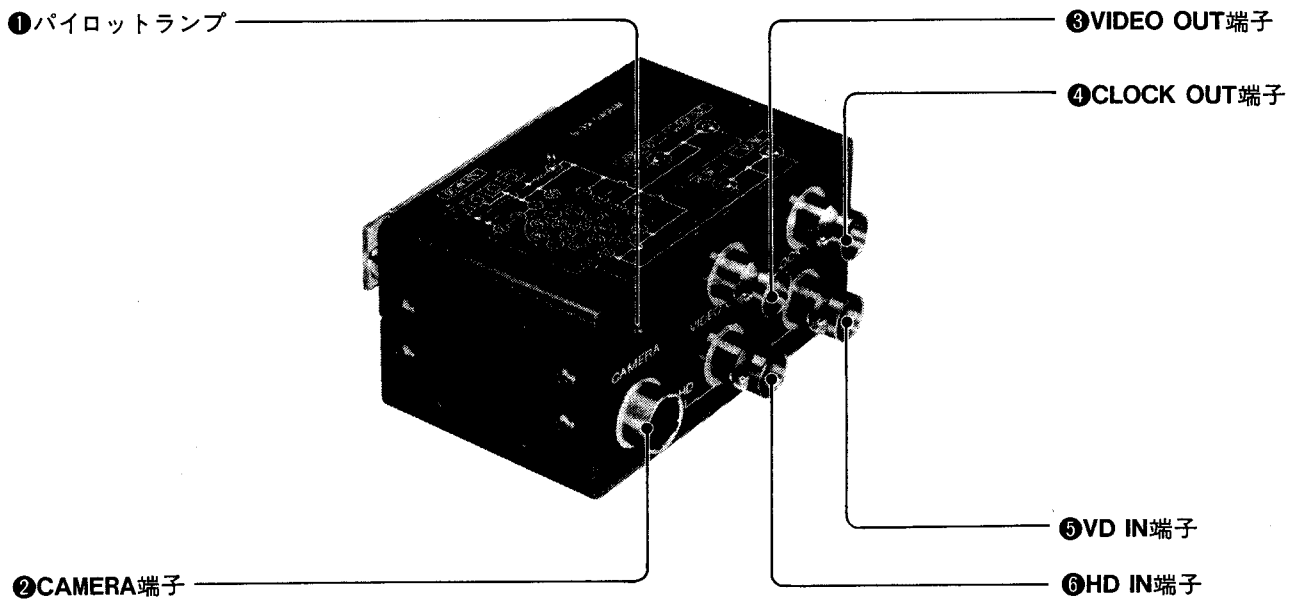
この端子のピン配置は下図のとおりです。



ピン番号	信号
1	＋12V
2	アース
3	——
4	映像信号

1-3-2. ジャンクションボックスJB-77

前面



❶パイロットランプ

DC 12V電源が供給されると点灯します。

❷CAMERA(カメラ)端子(12ピン)

カメラモジュールへDC 12V電源の供給と外部同期信号の送出を行うとともに，カメラモジュールから映像信号を入力します。

接続には，カメラケーブルCCXC-12P02/12P05/12P10/12P25を使用します。

❸VIDEO OUT(映像出力)端子(BNCコネクター)

カメラモジュールからの映像信号を出力します。

ビデオモニター，VTRなどに接続します。

❹CLOCK OUT(内部同期信号出力)端子

カメラモジュールを単独で使用する場合，クロック信号を出力します。

❺VD IN端子(BNCコネクター)

VD信号またはS/VS/VBS信号を入力します。これにより，カメラモジュールを外部同期で動作させることができます。

・VD信号入力時は，HD IN端子にHD信号を入力してください。

・S/VS/VBS信号入力時は，HD IN端子にHD信号を入力しないでください。

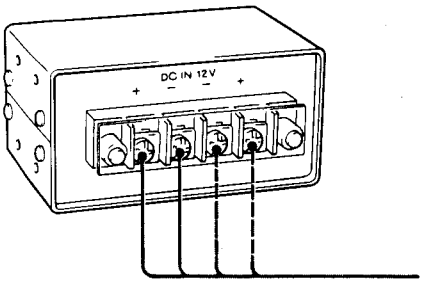
またカメラモジュールを単独で使用する場合，カメラモジュールの内部配線を変更することによって，VD信号を出力できます。

❻HD IN端子

HD信号を入力します。VD IN端子から入力されるVD信号と合わせて，カメラモジュールを外部同期で動作させることができます。

またカメラモジュールを単独で使用する場合，カメラモジュールの内部配線を変更することによって，HD信号を出力できます。

裏面



DC IN 12V(DC 12V電源入力)端子

DC IN 12V(DC 12V電源入力)端子

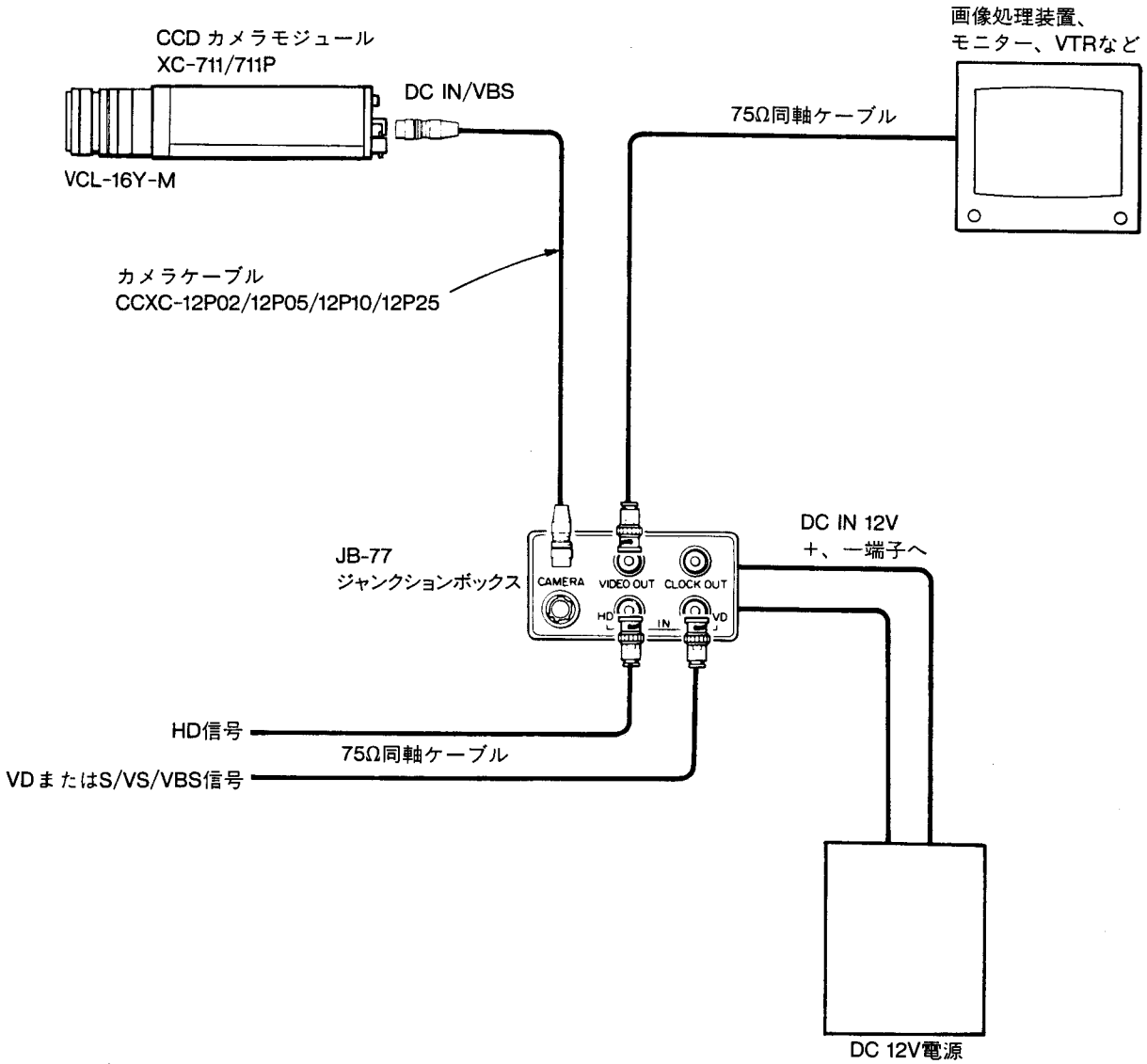
DC 12V電源の入力端子です。1組の＋と－端子を電源に接続します。

カメラモジュールを複数台接続するときは，あいている方の＋と－端子を別のJB-77への電源供給に使用することができます。

1-4. 接続例

1-4-1. ビデオ出力を使用するには

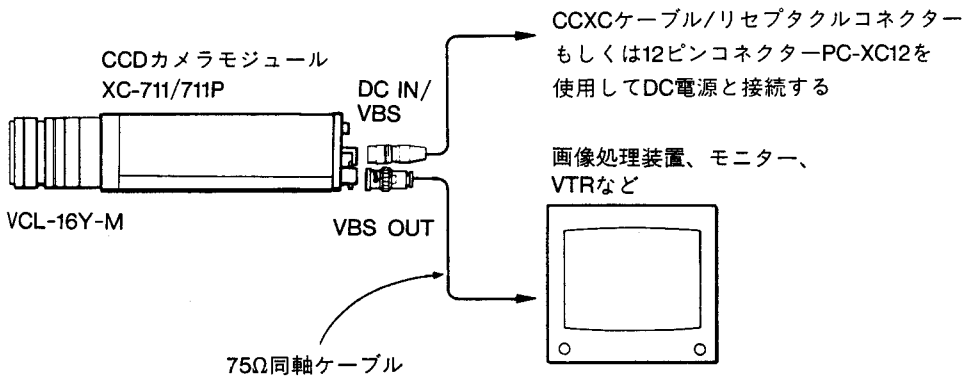
ジャンクションボックスを使用する場合



ご注意

CCXCケーブルを使用してVBS信号またはVS信号による外部同期をかける場合，カメラケーブルCCXC-12P25を使用するとゲンロック時の画像に外部同期信号の影響が出る場合があります。その場合には，S（複合同期）信号のみを使用してください。

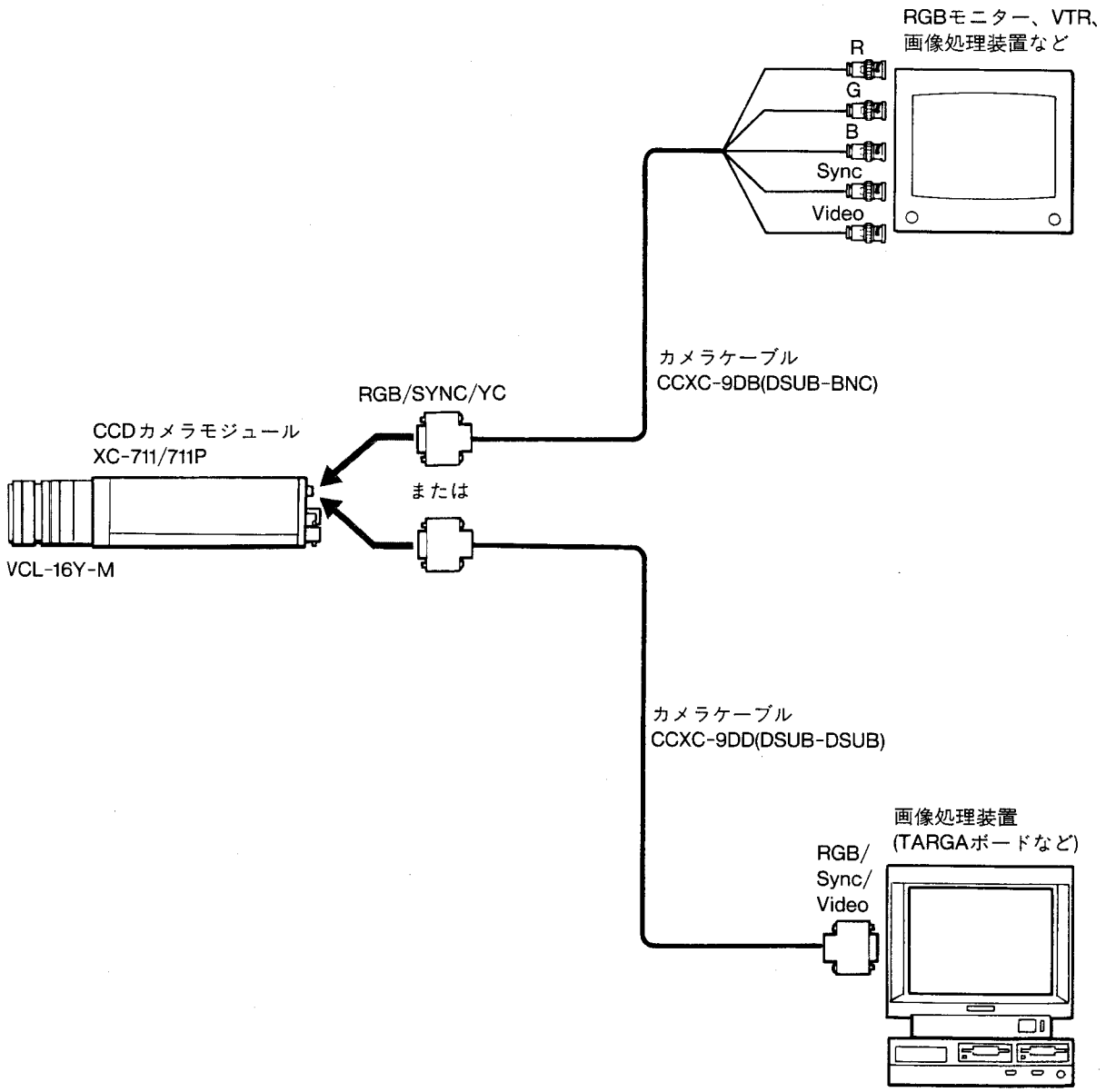
ジャンクションボックスを使用しない場合



ご注意

- 映像出力をVBS OUT端子から取り出すときは，DC IN/VBS端子は電源供給用に使い，DC IN/VBS端子の接続にはCCXC-12P02ケーブルをご使用ください。このとき12ピンコネクターの映像出力を終端しないでください。
- DC IN/VBS端子に5m以上のケーブルをつないだ場合は，VBS OUT端子から映像出力を取り出すことはできません。

1-4-2. RGB出力を使用するには



ご注意

電源供給はDC IN/VBS端子から行って下さい。

1-5. モードの初期設定

本機では，次の13項目についてそれぞれモードの切り換えが可能です。各項目とも上が工場出荷時の初期設定モードです。詳細は第2章を参照して下さい。

項　目	モード	備　考
利得	FIX(0dB)	固定(−6,0,+6,+12dBのいずれかを選択)
	AUTO	自動制御
γ補正	ON	γ補正あり
	OFF	γ補正せず
フィールド	NORMAL	通常走査
	INVERSE	偶数フィールドと奇数フィールドを逆にする
電荷蓄積	FRAME	フレーム蓄積
	FIELD	フィールド蓄積
RESTART RESET	NORMAL	フレーム同期せず
	RESET	フレーム同期
ホワイトバランス	AUTO	自動調整(2600°K～9000°K)
	PRESET	固定(3200°K)あるいは半固定(2600°K～9000°K)
Y/C	COMPOSITE	VBS(またはY)出力
	SEPARATE	Y(およびC)出力
G ON SYNC	NO	通常出力(RGB)
	YES	G出力に同期信号付加
HUEプリセット	NO	HUE補正あり
	YES	HUE補正せず
電子シャッター	OFF	フリッカーレス指定できない。
	ON	シャッタースピードを$\frac{1}{60}$, $\frac{1}{125}$, $\frac{1}{250}$, $\frac{1}{500}$, $\frac{1}{1000}$, $\frac{1}{2000}$, $\frac{1}{4000}$, $\frac{1}{10000}$秒から選択する。*
電子シャッターフリッカーレス	OFF	フリッカーレス動作せず(上記シャッタースピード)
	ON	フリッカーレス動作(シャッタースピード$\frac{1}{120}$または$\frac{1}{100}$秒)
SYNCレベル	0.3Vp-p	
	2.0Vp-p	
同期	EXERNAL	外部から同期信号を入力
	INTERNAL	外部へ同期信号を出力

＊：XC-711では$\frac{1}{60}$秒のシャッタースピードはフレーム蓄積でしか実行できません。

1-6. 使用上のご注意

電源について

DC 12Vで動作します。リップル，ノイズのない安定した電源をお使いください。

異物について

内部に液体をこぼしたり，燃えやすいものや，金属類を落とさないでください。そのまま使用すると火災や感電，故障，事故の原因となります。

動作中は布などで包まないでください。

使用・保管場所

次のような場所での使用および保管はお避けください。

・極端に暑い所や寒い所。(使用温度は0℃～40℃)
・湿気，ほこりの多い所。
・雨にあたる所。
・激しい振動のある所。
・強力な電波を発生するテレビ，ラジオの送信所の近く。

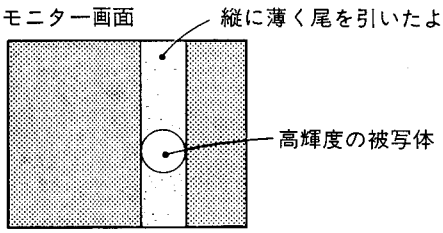
お手入れ

レンズや光学フィルターの表面に付着したごみやほこりは，ブロアーで払ってください。外装の汚れは，中性洗剤溶液を少し含ませた布でふきとった後，からぶきします。アルコール，ベンジンなどは，外装が変質したり，塗料がはげることがありますので使用しないでください。

1-7. CCD特有の現象

スミア現象

高輝度の被写体(電灯，蛍光灯，太陽，強い反射光など)を写したときに起こる現象。



折り返しひずみ

縞模様，線などを写すと，ギザギザに見えることがあります。

傷

CCDはフォトセンサー(感光素子)が縦横に並んでできており，フォトセンサーのいずれかに欠陥があると，その部分だけ画像が写らず，モニター画面上に傷となってみえます(実用上支障がない程度)。

微小白点

高温時，暗い被写体を写している場合，画面全体に多数の白点が現れることがあります。

第2章
製品仕様

2-1. 仕様

〈カメラモジュール XC-711〉

撮像素子	インターライン転送方式CCD
有効画素数	768(H)×493(V)
撮像面積	8.8mm×6.6mm (⅔インチサイズ)
光学黒期間	各水平走査線のうち50画素
垂直駆動周波数	15.734KHz ±1%
水平駆動周波数	14.318MHz
信号方式	EIA方式
セルサイズ	11μm(H)×13μm(V)
チップサイズ	10.0mm(H)×8.2mm(V)
光学系	
レンズマウント	Cマウント
フランジバック	17.526mm
同期方式	内部/外部自動切り替え
外部同期入力	S/VBS/VS(SYNCレベル：0.3Vp-p±6dB) HD, VD(HD, VDレベル：2～5Vp-p)
外部同期許容周波数偏差	±1%
ジッター	±100nsec以内
電源投入時のロック時間	10sec以内
走査方式	525本 2:1インターレース
映像出力	VBS(1.0Vp-p同期負, 75Ω不平衡) RGB(0.7Vp-p)
水平解像度	330TV本
垂直有効ライン数	485本 2:1インターレース
感度	2000Lux, F4(γON/0dB)
最低被写体照度	25Lux, F1.4, +12dB
S/N比	50dB
電源電圧(範囲)	DC 12V(10.5～15V)
消費電力	5.5W
重さ	
カメラモジュール	380g (XC-711)
ジャンクションボックス	170g (JB-77)
保存温度	−20℃～+50℃
性能保証温度	0°C～40°C
耐衝撃	70G
保存湿度	90%以下
動作湿度	70%以下

〈標準レンズ VCL-16Y-M〉

焦点距離	16mm
最大口径比	1:1.4
絞り	F1.4～F16
フィルター取り付けねじ	M25.5mm×P0.5mm
マウント	Cマウント
重さ	50g

2-4. 動作モードの設定

XC-711は，用途に応じて動作モードを切り換えることが可能です。
モード設定には，スイッチによる設定方法と半田ジャンパーによる設定方法があります。

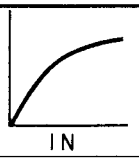
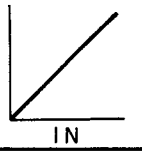
番号	項　　目	対象基板名	設定方法
1	γ補正モード	EN-72	スイッチ
2	ホワイトバランスモード		
3	Y/Cセパレートモード		ジャンパー
4	*クロマ信号OFFモード		
5	GAINモード	YC-38	スイッチ
6	G ON SYNCモード	RD-14	ジャンパー
7	SYNC出力レベル		
8	HUE PRESETモード	PR-122	
9	電子シャッターモード	DR-83	スイッチ ジャンパー
10	蓄積モード	TG-48	ジャンパー
11	*フィールド反転モード		
12	*RESTART RESETモード		
13	同期モード	MB-222	

＊クロマ信号OFFモード，フィールド反転モード，RESTART RESETモードは，外部同期モードの場合にのみ設定可能です。

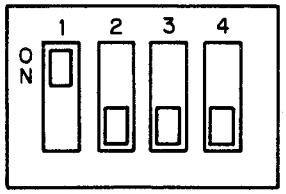
●各動作モードの説明

1．γ補正モード（γON/γOFF）
RGB，VBS出力信号のγ補正を設定します。γ補正をONに設定するとγ補正が行われたRGB，VBS信号を出力します。
γ補正をOFFに設定すると，γ補正を行いません。よって，被写体の光量に比例したRGB出力信号を得ることができます。また，γ補正をOFFに設定したときのVBS出力信号は，クロマ成分は無く輝度成分のみの信号となります。
設定は，EN-72基板のDIPスイッチ（SW1-1）で行われます。このスイッチが「ON」のときはγONに，「OFF」のときはγOFFになります。工場出荷時はγONに設定されています。

2．ホワイトバランスモード（AUTO/PRESET）
ホワイトバランスをとる際の色温度を設定します。
ホワイトバランスをAUTOに設定すると，被写体の色温度に応じて自動的にホワイトバランスをとります。
PRESETに設定すると，3200°Kあるいは，5600°Kの固定した色温度によってホワイトバランスをとります。
AUTO/PRESETの設定は，EN-72基板のDIPスイッチ（SW1-2）で行われます。このスイッチが「ON」のときはAUTOに，「OFF」のときはPRESETになります。また，3200°K/5600°Kの設定は，同基板のDIPスイッチ（SW1-3）で行われます。このスイッチが「ON」のときは5600°Kに，「OFF」のときは3200°Kになります。
工場出荷時は，PRESET 3200°Kに設定されています。
尚，PRESET時の「5600°K」の色温度は，工場出荷時に5600°Kに合うよう調整してありますが，MD-61基板のRV5，RV6によって変更することができます。

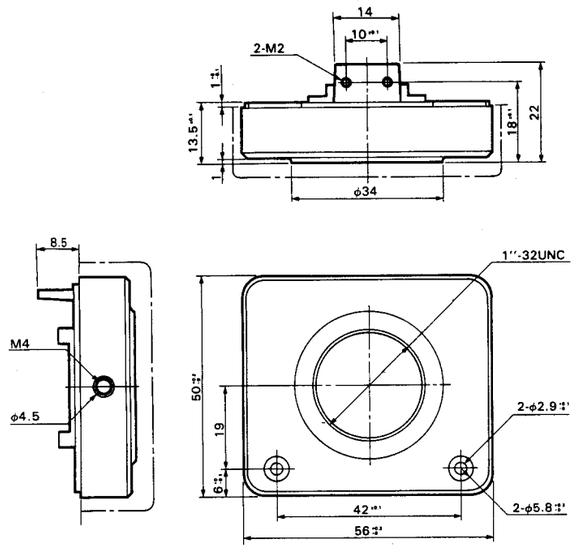
SW1-1	MODE	入出力特性
ON	γ ON (0.45)	
OFF	γ OFF (1.0)	

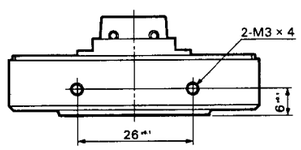
SW1-2	MODE	SW1-3	色温度
ON	AUTO	ON	2600°K ～ 9000°K
		OFF	
OFF	PRESET	ON	5600°K 変更可能
		OFF	3200°K 変更不可



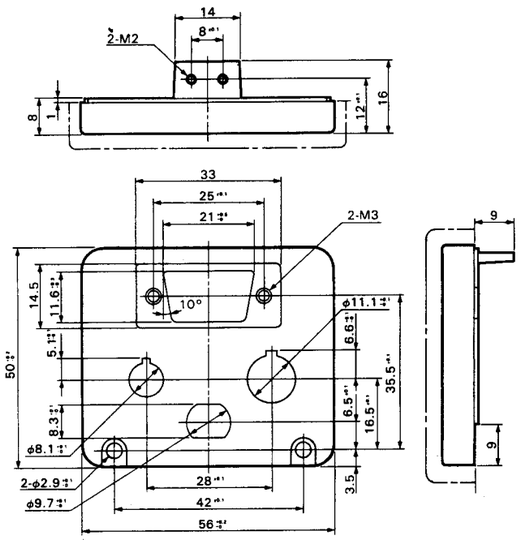
EN-72基板スイッチ（SW1）
（工場出荷時設定）

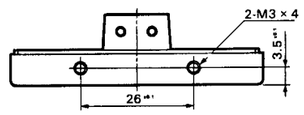
Ⓐ部


14
10
2-M2
1
13.5
18
22
1
φ34
8.5
M4
φ4.5
1"-32UNC
50
19
6
2-φ2.9
2-φ5.8
42
56

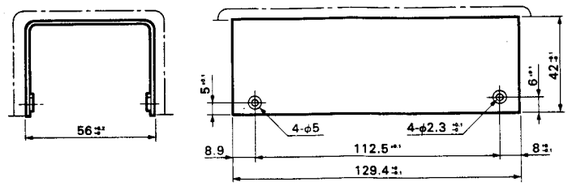

2-M3 × 4
6
26

Ⓑ部

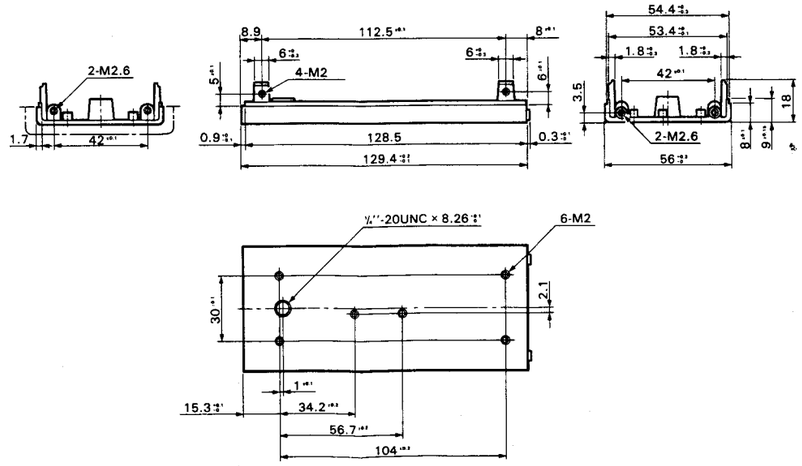

14
8
2-M2
8
1
12
16
33
25
21
2-M3
9
14.5
11.6
10°
φ11.1
6.6
5.1
35.5
50
6.5
16.5
8.3
φ8.1
9
2-φ2.9
3.5
28
φ9.7
42
56


2-M3 × 4
3.5
26

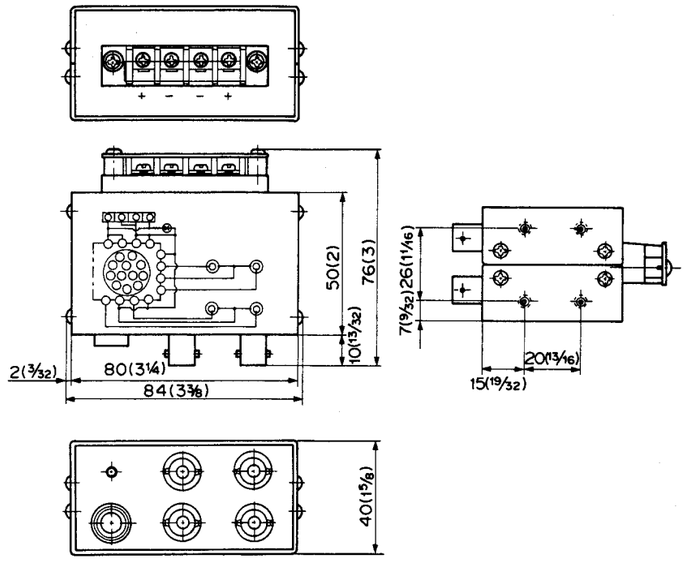
Ⓒ部


56
5
4-φ5
4-φ2.3
6
42
8.9
112.5
8
129.4

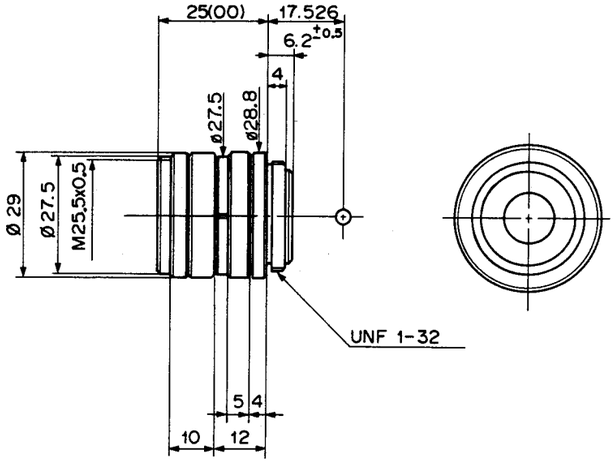
Ⓓ部


2-M2.6
1.7
42
8.9
112.5
8
6
6
5
4-M2
6
0.9
128.5
0.3
129.4
54.4
53.4
1.8
1.8
42
3.5
18
2-M2.6
8
9
56
1/4"-20UNC × 8.26
6-M2
30
2.1
1
15.3
34.2
56.7
104

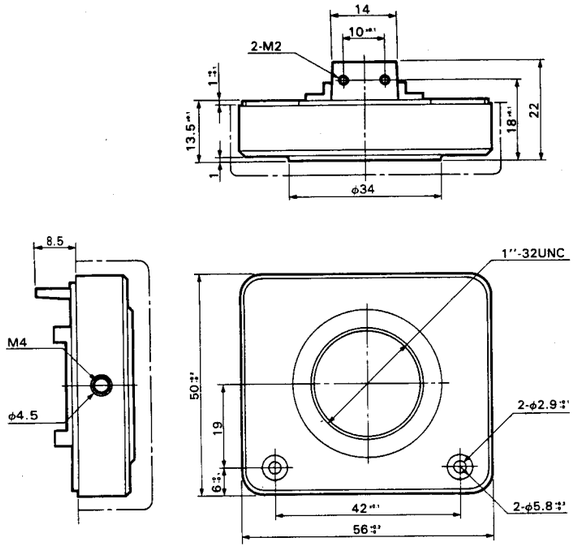
ジャンクションボックス <**JB-77**>

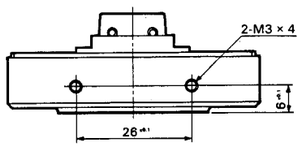


レンズ <**VCL-16Y-M**>

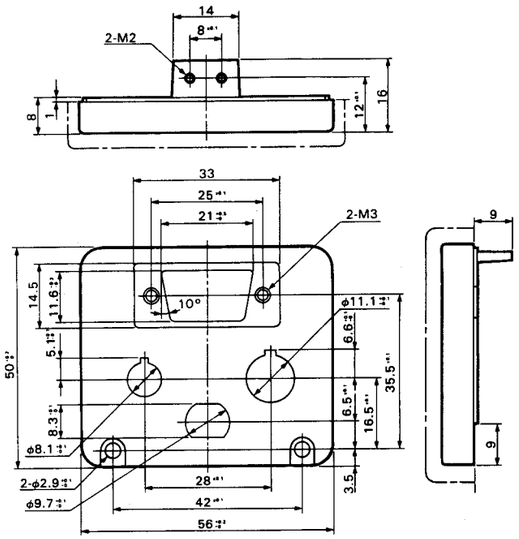


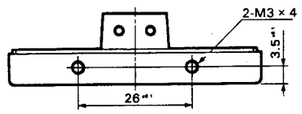
Ⓐ


14
10
2-M2
1
13.5
18
22
1
φ34
8.5
M4
φ4.5
1''-32UNC
50
19
6
2-φ2.9
2-φ5.8
42
56

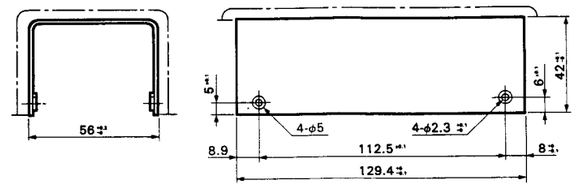

2-M3 × 4
6
26

Ⓑ

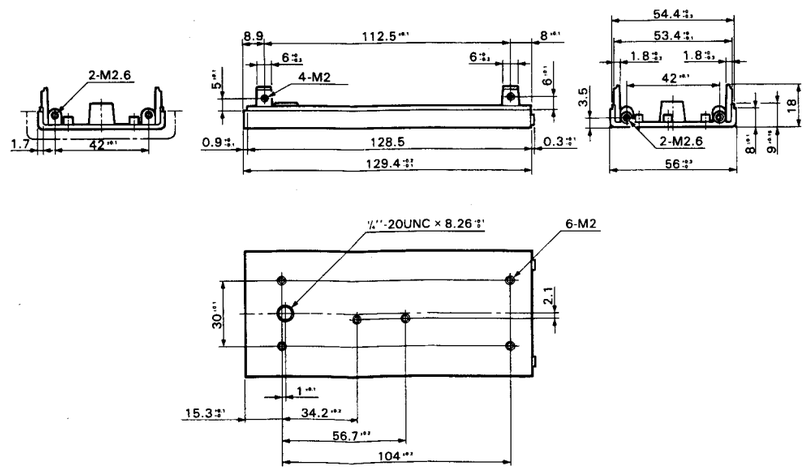

14
8
2-M2
8
1
12
16
33
25
21
2-M3
9
14.5
11.6
10°
φ11.1
6.6
5.1
50
35.5
8.3
6.5
16.5
φ8.1
9
2-φ2.9
φ9.7
28
42
3.5
56


2-M3 × 4
3.5
26

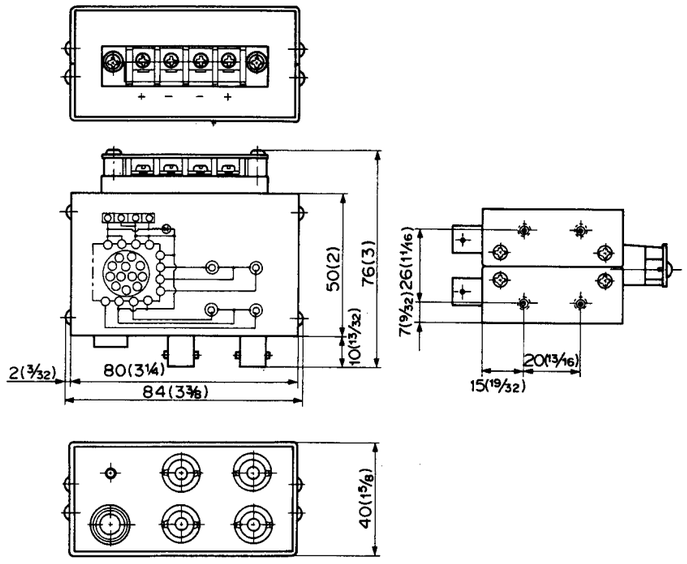
Ⓒ


56
5
42
6
4-φ5
4-φ2.3
8.9
112.5
8
129.4

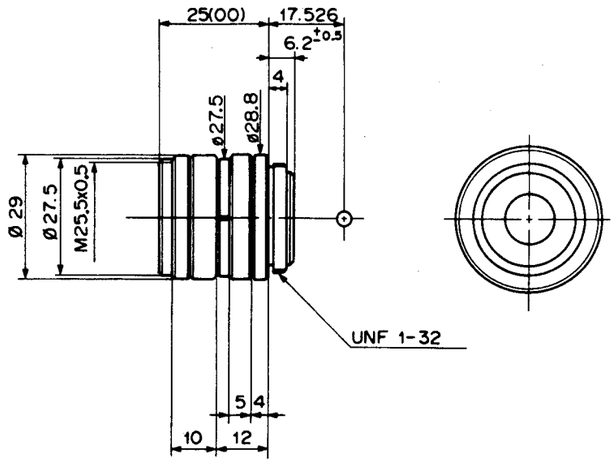
Ⓓ

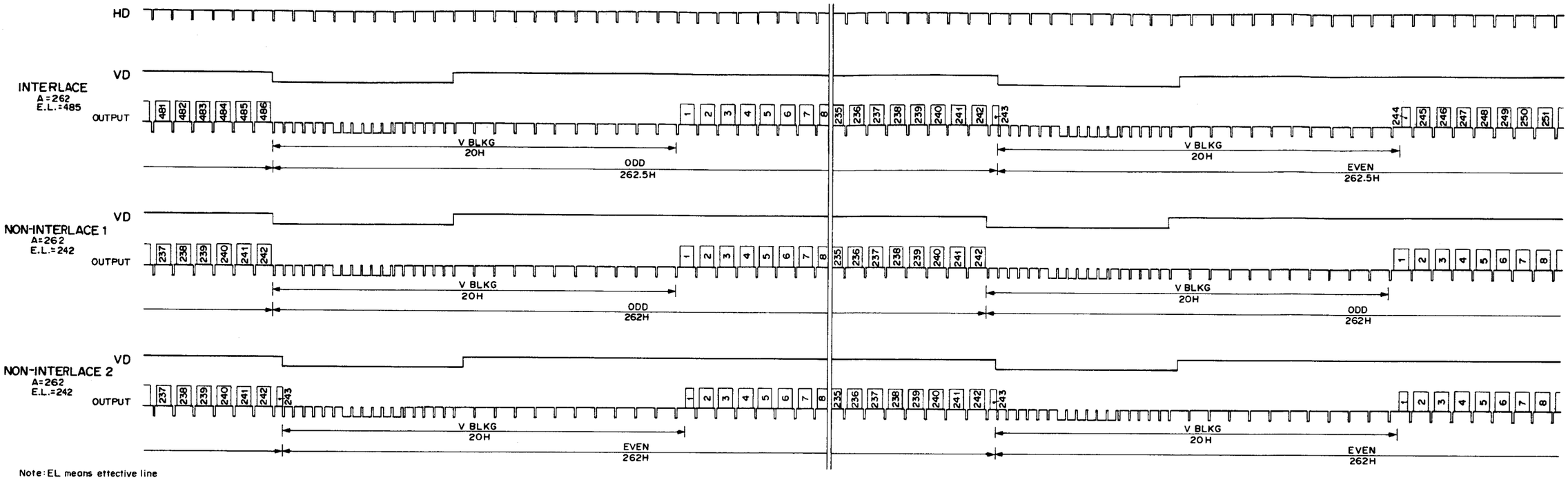

2-M2.6
1.7
42
8.9
112.5
8
6
6
4-M2
5
6
0.9
128.5
0.3
129.4
54.4
53.4
1.8
1.8
42
3.5
18
2-M2.6
8
9
56
1/4''-20UNC × 8.26
6-M2
30
2.1
1
15.3
34.2
56.7
104

Junction box <JB-77>



Lens <VCL-16Y-M>



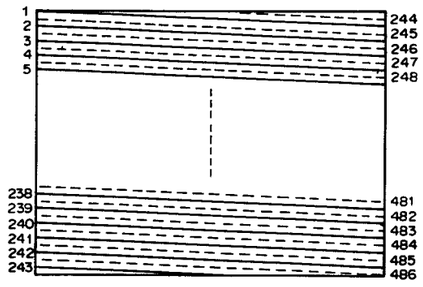


Note: EL means ettective line

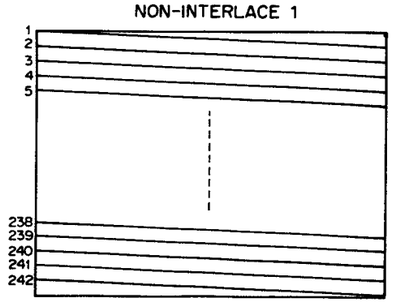
注意：E.L.は有効ライン数です。

リードアウトモード設定	
走査方式	
走査	NORMAL MODE
	INVERSE MODE
蓄積時間と映像出力の関係	
垂直解像度(TV本)	
RESTART RESET	
特徴と用途	

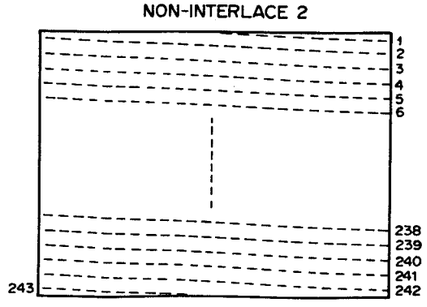
INTERLACE



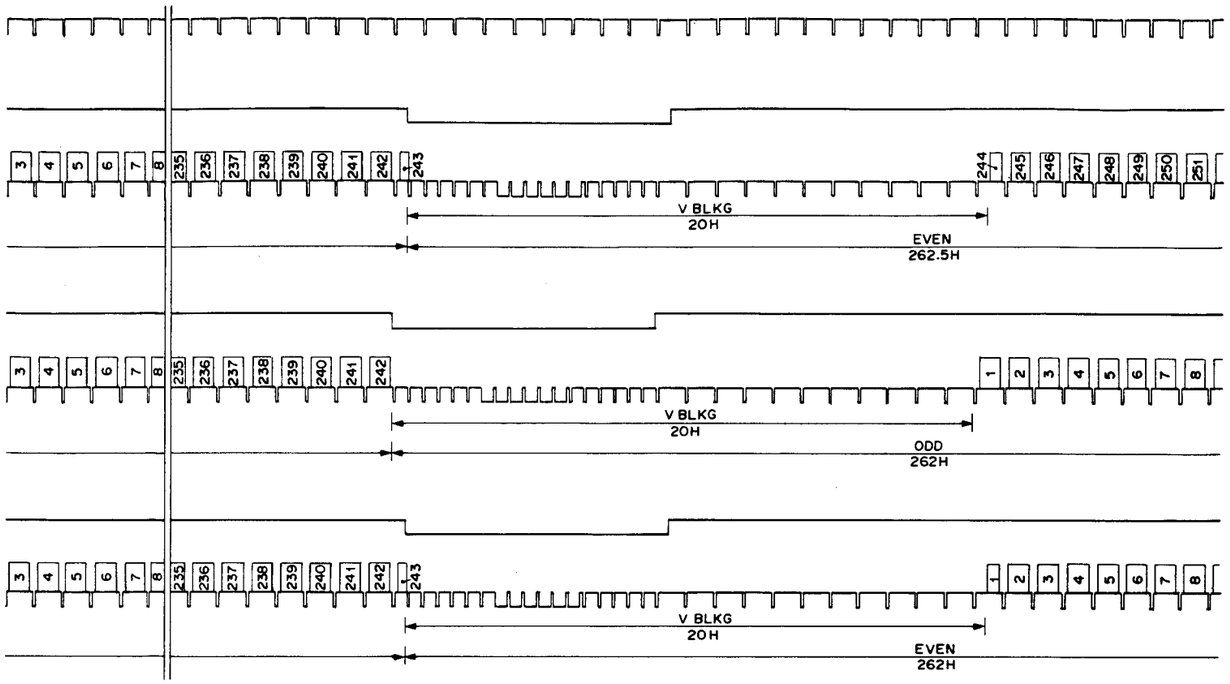
NON-INTERLACE 1



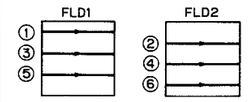
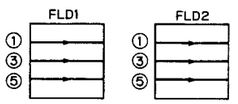
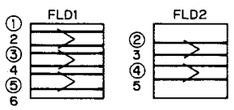
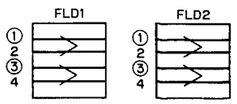
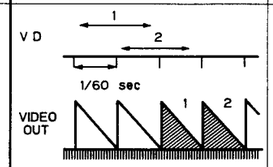
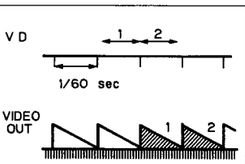
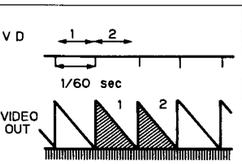
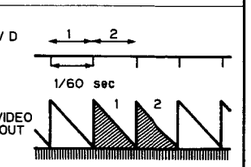
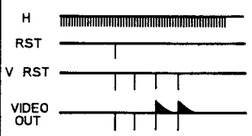
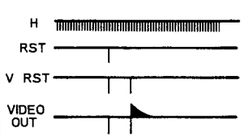
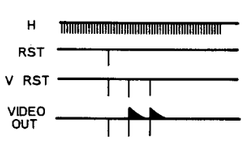
NON-INTERLACE 2

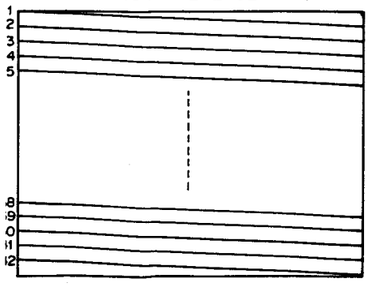


〔図1〕

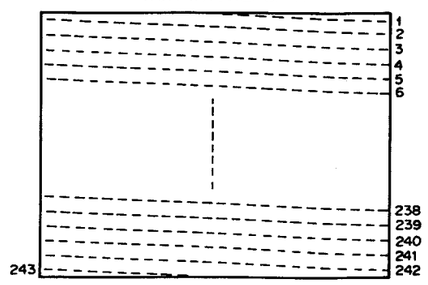


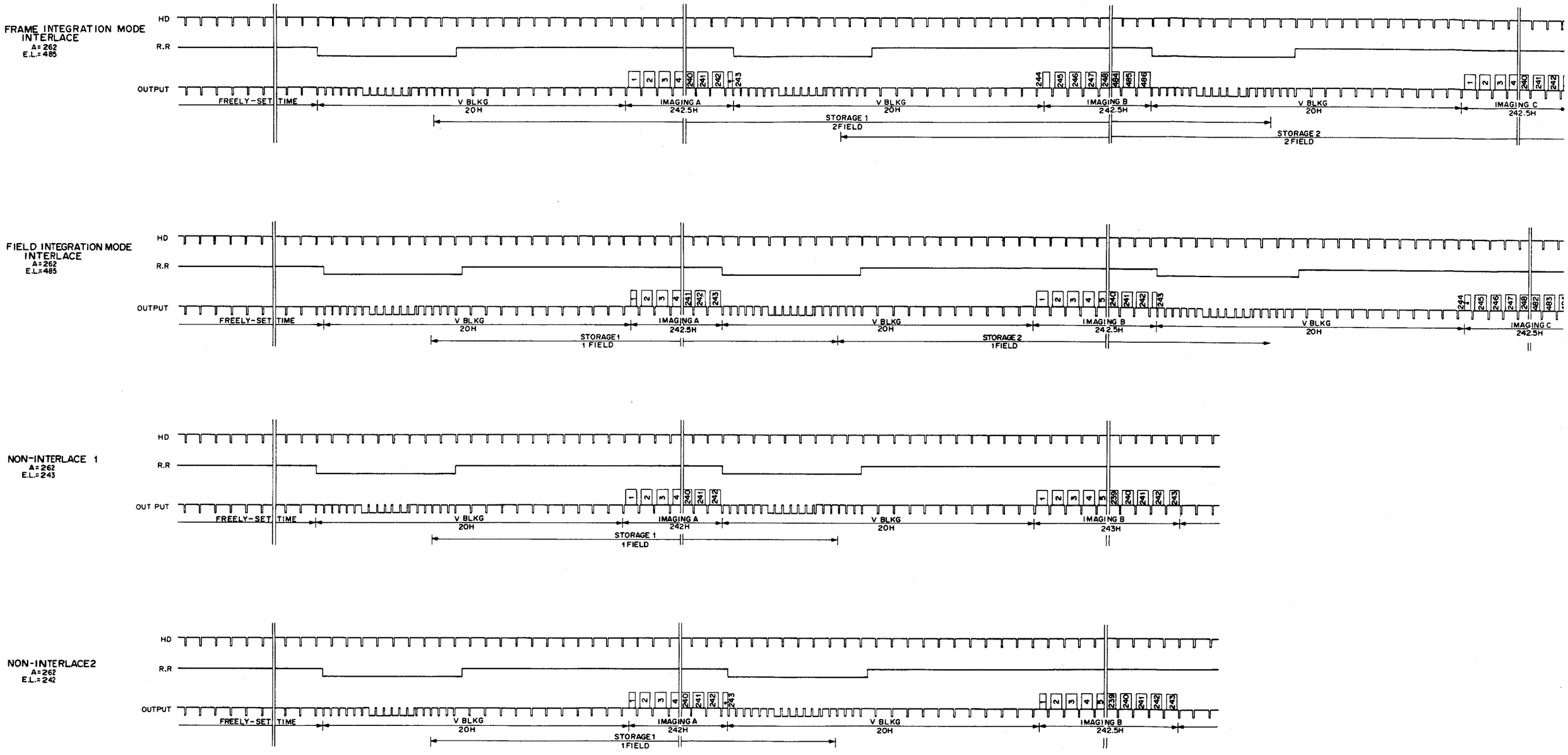
〔図2〕 走査方式と蓄積モードの関係

リードアウトモード設定		フレーム蓄積（初期設定側）		フィールド蓄積	
走査方式		インターレス	ノンインターレス	インターレス	ノンインターレス
走査	NORMAL MODE				
	INVERSE MODE	FLD 1/FLD 2が逆転。	FLD 1/FLD 2共に②，④，⑥…になる。	FLD 1/FLD 2が逆転。	FLD 1/FLD 2共に②，④，⑥…になる。
蓄積時間と映像出力の関係					
垂直解像度(TV本)		485	242	350	242
RESTART RESET					
特徴と用途		最も高い解像度が得られるので，フレームメモリーを持つ計測等に適する。	XC-39と同一システム。垂直の一本置き操作となる。注)動作はフィールド蓄積	$\frac{1}{60}$秒の蓄積により，フレーム蓄積よりもぶれの少ない画が得られる。移動物体を補らえるのに適する。	ノンインターレス時に，感度を落とさず，垂直の情報も全て取り入れるシステム。

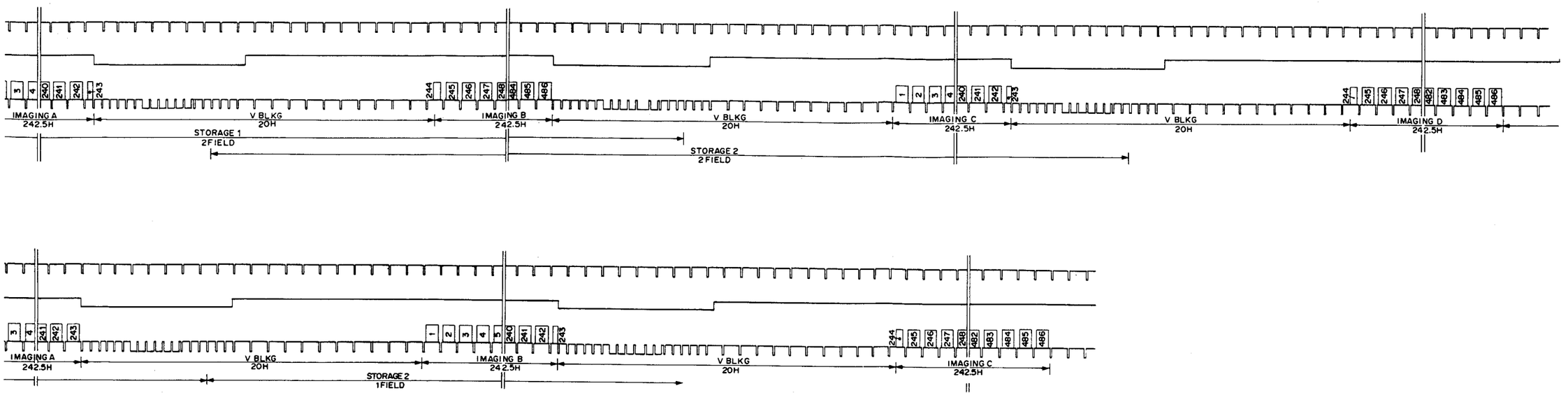


〔図1〕

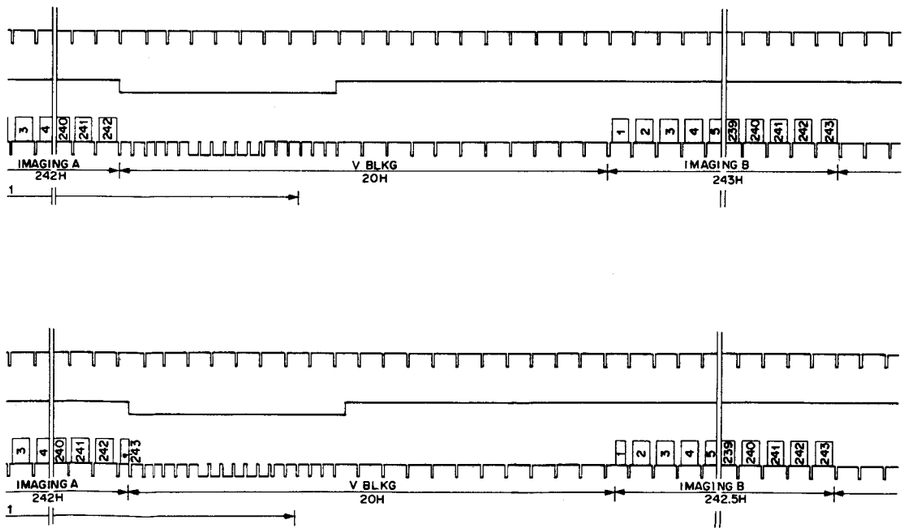



FRAME INTEGRATION MODE
INTERLACE
A=262
E.L.=485
HD
R.R
OUTPUT
FREELY-SET TIME
V BLKG
20H
IMAGING A
242.5H
V BLKG
20H
IMAGING B
242.5H
V BLKG
20H
IMAGING C
242.5H
STORAGE 1
2FIELD
STORAGE 2
2FIELD
FIELD INTEGRATION MODE
INTERLACE
A=262
E.L.=485
HD
R.R
OUTPUT
FREELY-SET TIME
V BLKG
20H
IMAGING A
242.5H
V BLKG
20H
IMAGING B
242.5H
V BLKG
20H
IMAGING C
242.5H
STORAGE1
1 FIELD
STORAGE 2
1FIELD
NON-INTERLACE 1
A=262
E.L.=243
HD
R.R
OUT PUT
FREELY-SET TIME
V BLKG
20H
IMAGING A
242H
V BLKG
20H
IMAGING B
243H
STORAGE 1
1FIELD
NON-INTERLACE2
A=262
E.L.=242
HD
R.R
OUTPUT
FREELY-SET TIME
V BLKG
20H
IMAGING A
242H
V BLKG
20H
IMAGING B
242.5H
STORAGE1
1FIELD

〔図3〕


IMAGING A
242.5H
V BLKG
20H
IMAGING B
242.5H
V BLKG
20H
IMAGING C
242.5H
V BLKG
20H
IMAGING D
242.5H
STORAGE 1
2FIELD
STORAGE 2
2FIELD

IMAGING A
242.5H
V BLKG
20H
IMAGING B
242.5H
V BLKG
20H
IMAGING C
242.5H
STORAGE 2
1FIELD


IMAGING A
242H
V BLKG
20H
IMAGING B
243H
IMAGING A
242H
V BLKG
20H
IMAGING B
242.5H

〔図3〕

2-3-3. RESTART RESETモード

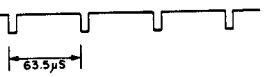
RESTART RESET（R.R）モードを使うと任意の時刻に1画面の情報を取り出すことができます。
R.Rモードを使う場合は，カメラ内部でモードを設定する必要があります。
2-4.モード設定を参照してモードを設定して下さい。HD，R.Rを12ピンコネクターの6番ピンと7番ピンにそれぞれ加えることで，出力を得ることができます。

●HD，R.Rの入力条件

・周波数（周期）

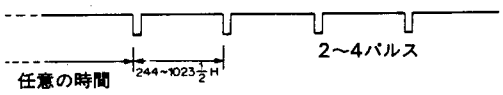
HD　15.734kHz±1%（63.56μS±1%）

連続パルス



R.R　244～1023$\frac{1}{2}$H

2～4パルス（モードによって異なります。）

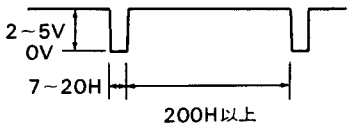


・位相

2-3-2. HD，VDモードの位相条件と同じです。
参照して下さい。

ご注意

電源投入直後に動作を開始させるためには、下記に示す2パルスのリセットパルスを12ピンコネクターの7番ピンに加えることが必要です。



●タイミングチャートの説明

〔図3〕は各動作モード別のタイミングチャートです。以下に詳細を説明します。

・フレーム蓄積，インターレースモード

R.Rが4パルス必要です。R.Rの周期を（A+$\frac{1}{2}$）Hにします。「Aは244～1023までの整数（図はA=262）」
IMAGING C（ODD）とIMAGING D（EVEN）の期間にそれぞれSTORAGE 1，STORAGE 2の間に撮像した情報が出力されます。IMAGING A，IMAGING Bの期間にCCDがリセットされます。よって，この間に出力される信号は意味がありません。

・フィールド蓄積，インターレースモード

R.Rが3パルス必要です。R.Rの周期を（A+$\frac{1}{2}$）Hにします。「Aは244～1023までの整数（図はA=262）」
IMAGING B（ODD）とIMAGING C（EVEN）の期間にそれぞれSTORAGE 1，STORAGE 2の間に撮像した情報が出力されます。IMAGING Aの期間にCCDがリセットされます。よって，この間に出力される信号は意味がありません。

・ノンインターレースモード

蓄積モードに関係なくR.Rが2パルス必要です。
R.Rの周期をA Hにします。「Aは244～1023までの整数（図はA=262）」
IMAGING Bの期間にSTORAGE 1の間に撮像した情報が出力されます。IMAGING Aの期間にCCDがリセットされます。よって，この間に出力される信号は意味がありません。

2-4. 動作モードの設定

XC-711は，用途に応じて動作モードを切り換えることが可能です。
モード設定には，スイッチによる設定方法と半田ジャンパーによる設定方法があります。

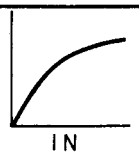
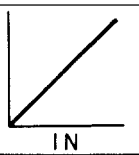
番号	項　　目	対象基板名	設定方法
1	γ補正モード	EN-72	スイッチ
2	ホワイトバランスモード		
3	Y/Cセパレートモード		ジャンパー
4	*クロマ信号OFFモード		
5	GAINモード	YC-38	スイッチ
6	G ON SYNCモード	RD-14	ジャンパー
7	SYNC出力レベル		
8	HUE PRESETモード	PR-122	
9	電子シャッターモード	DR-83	スイッチ ジャンパー
10	蓄積モード	TG-48	ジャンパー
11	*フィールド反転モード		
12	*RESTART RESETモード		
13	同期モード	MB-222	

＊クロマ信号OFFモード，フィールド反転モード，RESTART RESETモードは，外部同期モードの場合にのみ設定可能です。

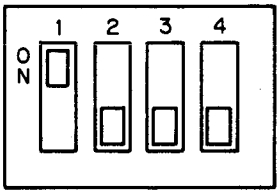
●各動作モードの説明

1．γ補正モード（γON/γOFF）
RGB，VBS出力信号のγ補正を設定します。γ補正をONに設定するとγ補正が行われたRGB，VBS信号を出力します。
γ補正をOFFに設定すると，γ補正を行いません。よって，被写体の光量に比例したRGB出力信号を得ることができます。また，γ補正をOFFに設定したときのVBS出力信号は，クロマ成分は無く輝度成分のみの信号となります。
設定は，EN-72基板のDIPスイッチ（SW1-1）で行われます。このスイッチが「ON」のときはγONに，「OFF」のときはγOFFになります。工場出荷時はγONに設定されています。

2．ホワイトバランスモード（AUTO/PRESET）
ホワイトバランスをとる際の色温度を設定します。
ホワイトバランスをAUTOに設定すると，被写体の色温度に応じて自動的にホワイトバランスをとります。
PRESETに設定すると，3200°Kあるいは，5600°Kの固定した色温度によってホワイトバランスをとります。
AUTO/PRESETの設定は，EN-72基板のDIPスイッチ（SW1-2）で行われます。このスイッチが「ON」のときはAUTOに，「OFF」のときはPRESETになります。また，3200°K/5600°Kの設定は，同基板のDIPスイッチ（SW1-3）で行われます。このスイッチが「ON」のときは5600°Kに，「OFF」のときは3200°Kになります。
工場出荷時は，PRESET 3200°Kに設定されています。
尚，PRESET時の「5600°K」の色温度は，工場出荷時に5600°Kに合うよう調整してありますが，MD-61基板のRV5，RV6によって変更することができます。

SW1-1	MODE	入出力特性
ON	γ ON (0.45)	
OFF	γ OFF (1.0)	

SW1-2	MODE	SW1-3	色温度
ON	AUTO	ON	2600°K ～ 9000°K
		OFF	
OFF	PRESET	ON	5600°K 変更可能
		OFF	3200°K 変更不可



EN-72基板スイッチ（SW1）
（工場出荷時設定）

SW1-1
SW1-2
SW1-4（未使用）
SW1-3

3. Y/Cセパレートモード（COMPOSITE/SEPARATE）

D-SUBコネクタからのビデオ出力信号の信号形式を設定します。

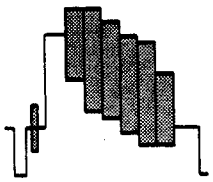
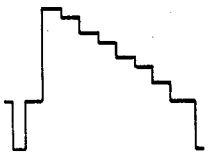
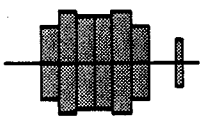
COMPOSITEに設定すると，DSUBコネクタの6番ピンからVBS信号が出力されます。しかし，クロマ信号OFFモードあるいは，γOFFモードでは，Y（輝度）信号のみ出力となります。

SEPARATEに設定すると，DSUBコネクタの6番ピンからY信号が，また，9番ピンからC（クロマ）信号が出力されます。しかし，クロマ信号OFFモードあるいは，γOFFモードでは，C信号は9番ピンから出力されません。

設定は，EN-72基板のジャンパーランド「VBS」「Y OUT」「C OUT」で行います。

COMPOSITEに設定する場合，「VBS」をショート（短絡）し，「Y OUT」と「C OUT」をオープン（開放）にします。SEPARATEに設定する場合，「VBS」をオープンにし，「Y OUT」と「C OUT」をショートします。

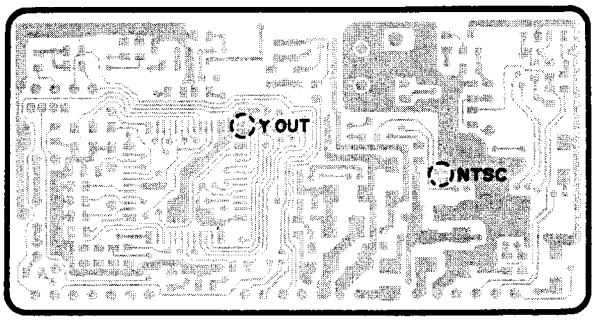
工場出荷時は，COMPOSITEに設定されています。

MODE		COMPOSITE	SEPARATE
「VBS」		ショート	オープン
「Y OUT」 「C OUT」		オープン	ショート
DSUB 出力例	6番ピン		
	9番ピン	—	

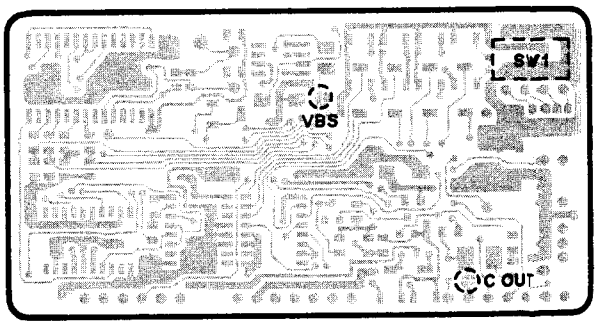
4. クロマ信号OFFモード

外部同期入力モードにおいて，ビデオ信号出力のクロマ成分をカットして出力する場合に設定するモードです。設定は，EN-72基板のジャンパーランド「NTSC」で行います。

クロマ信号OFFモードに設定する場合，このジャンパーをショートします。設定しない場合は，オープンにします。工場出荷時は，クロマ信号OFFモードに設定してあります。



EN-72 BOARD A SIDE



EN-72 BOARD B SIDE

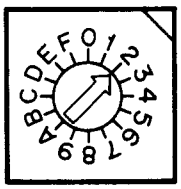
5. GAINモード（AUTO/FIX）

RGB，VBS出力信号のゲイン（利得）を設定します。

AUTOモードに設定すると，AGC（Automatic Gain Control)機能が働きます。AGCの最大ゲインは＋12dBです。

FIXモードでは，ゲインを−6dB，0dB，＋6dB，＋12dBのいづれかに固定します。

設定は，YC-38基板のロータリー型ディジタルスイッチ（SW1）で行います。



YC-38基板スイッチ(SW1)
（工場出荷時の設定）

位 置	MODE
0	AUTO
1	FIX −6dB
2	FIX 0dB
3	FIX +6dB
4	FIX +12dB

6. G ON SYNCモード

RGB出力信号中のG（緑）信号にSYNC信号を付加して出力する場合に設定するモードです。

設定は，RD-14基板のジャンパーランド「G ON SYNC」で行います。

G ON SYNCモードに設定する場合，このジャンパーをショートします。設定しない場合は，オープンにします。

工場出荷時は，G ON SYNCモードには設定されていません。

7. SYNC出力レベル（0.3Vp-p/2.0Vp-p）

DSUBコネクタの7番ピンから出力するSYNC出力信号のレベルを設定します。

設定は，RD-14基板のジャンパーランド「SYNC 2Vp-p」で行います。このジャンパーをショートすると，SYNC信号は約2.0Vp-pで出力されます。

また，オープンにすると，約0.3Vp-pで出力されます。

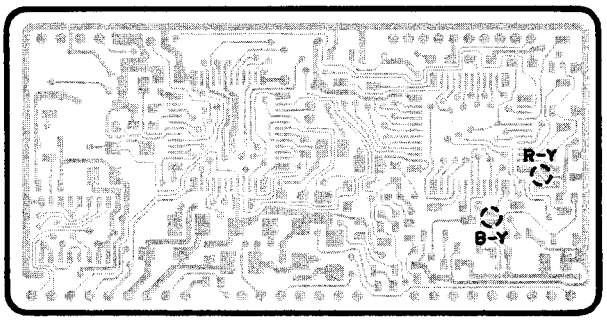
工場出荷時は，SYNC出力レベルを0.3Vp-pに設定しています。

8. HUE PRESETモード

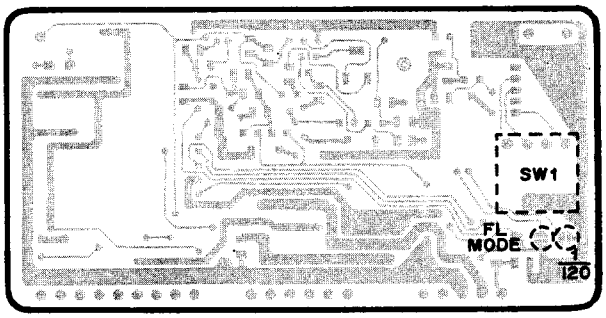
RGB，VBS出力信号のHUE補正を行わずに出力する場合に設定するモードです。

設定は，PR-122基板のジャンパーランド「R-Y」「B-Y」で行います。HUE PRESETモードに設定する場合，この2つのジャンパーをそれぞれショートします。設定しない場合は，ともにオープンにします。

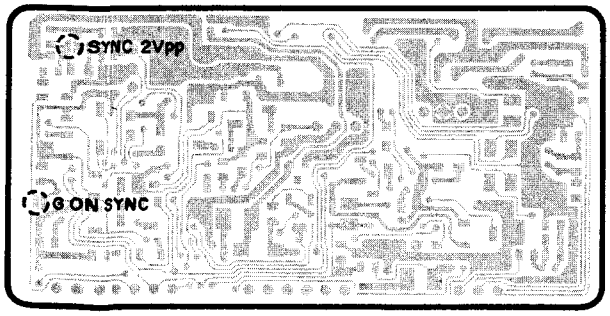
工場出荷時は，HUE PRESETモードには設定されていません。



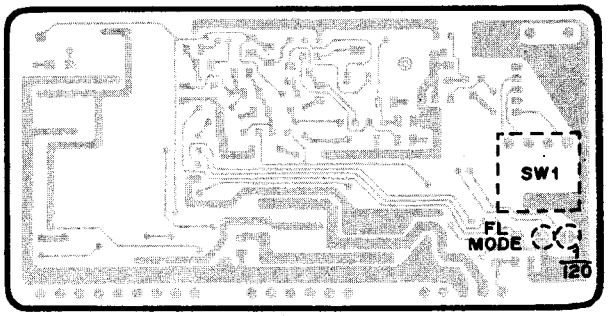
PR-122 BOARD A SIDE



DR-83 BORAD (SUFFIX-11) B SIDE



RD-14 BOARD A SIDE



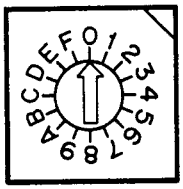
DR-83A BOARD (SUFFIX-12) B SIDE

9. 電子シャッターモード

電子シャッターのシャッタースピードを設定します。また，フリッカーレスモードの設定をします。

シャッタースピードの設定は，DR-83基板のロータリー型ディジタルスイッチ（SW1）で行います。

フリッカーレスモードの設定は，同基板のジャンパーランド「FL MODE」と「$\frac{1}{120}$」で行います。



DR-83基板スイッチ(SW1)
（工場出荷時設定）

位置	シャッタースピード	フリッカーレスモード
0~7	OFF	×
8	1/60秒*	○
9	1/125秒	
A	1/250秒	
B	1/500秒	
C	1/1000秒	
D	1/2000秒	
E	1/4000秒	
F	1/10000秒	

＊フレーム蓄積モードのみ可

フリッカーレスモードは，電源周波数に起因して発生する照明のちらつきを押えるためモードです。

ジャンパーランドは次のように設定します。フリッカーレスモードに設定しない場合は，「FL MODE」をオープンにしておきます。

電源周波数	FL MODE	$\frac{1}{120}$	シャッタースピード
50Hz地域	ショート	オープン	1/100秒
60Hz地域	ショート	ショート	1/120秒

工場出荷時は，フリッカーレスモードには設定されていません。

10. 蓄積モード（FRAME/FIELD）

CCDのフォトセンサーから信号電荷を読み出す周期を設定します。

FIELDに設定すると信号出荷を2群の画素から同時に読み出すフィールド蓄積モードになります。FRAMEに設定すると，信号電荷を2群の画素から交互に読み出すフレーム蓄積モードになります。フレーム蓄積モードは，インターレース動作時に比べてノンインターレース動作では，感度が半分になります。

（2-11頁の〔図2〕を参照）

設定は，TG-48基板のジャンパーランド「FLD」で行います。「FLD」をショートするとFIELDになります。また，オープンにするとFRAMEになります。

工場出荷時は，FRAMEに設定されています。

11. フィールド反転モード（NORMAL/INVENSE）

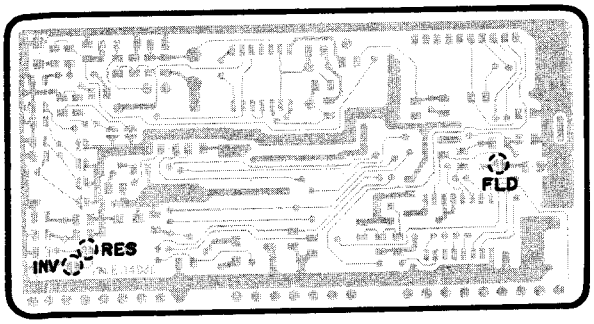
外部同期入力時にRGB, VBS出力信号のフィールド反転動作を設定します。

INVERSEに設定すると，RGB，VBS出力信号のフィールドが外部同期信号に対して反転します。つまり外部同期信号のフィールドがODDの時はEVEN，EVENの時はODDを出力します。

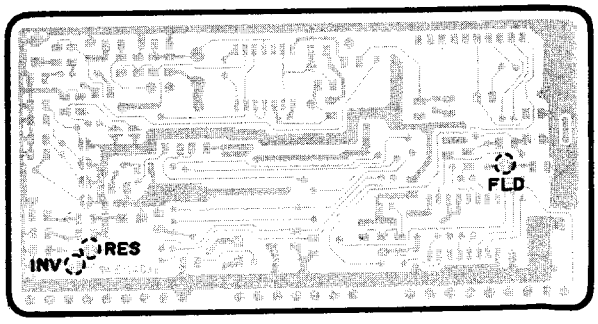
NORMALに設定すると，通常の外部同期時と同じで外部同期信号の　フィールドがODDの時はODD，EVENの時はEVENを出力します。

設定は，TG-48基板のジャンパーランド「INV」で行います。「INV」をショートすると，INVERSEになります。また，オープンにすると，NORMALになります。

工場出荷時は，NORMALに設定されています。



TG-48 BOARD (SUFFIX-11) B SIDE



TG-48 BOARD (SUFFIX-12) B SIDE

12. RESTART RESETモード（NORMAL/RESET）

外部同期モードにおいて，任意の時刻に1画面の情報を取り出すモードです。

設定は，TG-48基板のジャンパーランド「RES」とMB-222基板のジャンパーランド「NORM VD」で行います。

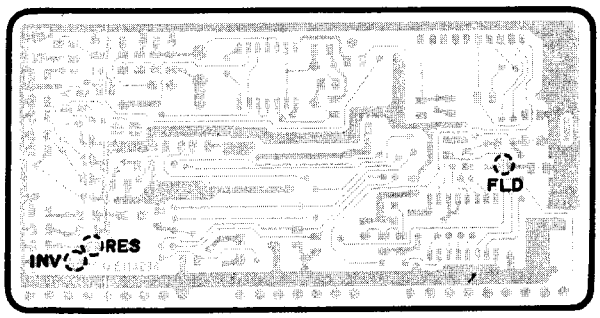
RESETに設定する場合は，「RES」をショートし，「NORM VD」をオープンにします。

NORMALに設定する場合は，「RES」をオープンにし「NORM VD」をショートします。

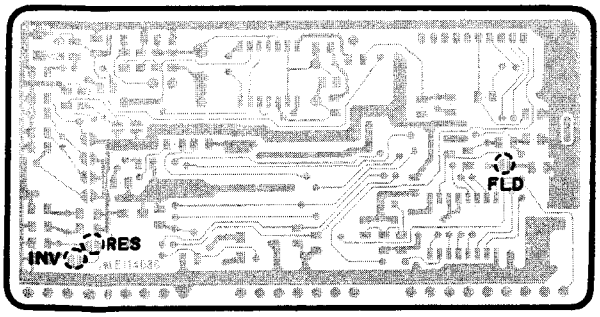
工場出荷時は，NORMALに設定されています。

（2-15頁の2-3-3. RESTART RESETモードも参照して下さい。）

MODE / ジャンパー	NORMAL	RESET
RES	オープン	ショート
NORM VD	ショート	オープン



TG-48 BOARD (SUFFIX-11) B SIDE



TG-48 BOARD (SUFFIX-12) B SIDE

13. 同期モード（INTERNAL/EXTERNAL）

同期信号を外部へ出力するか，外部から入力するかを設定します。

EXTERNAL（外部同期モード）に設定すると，外部から入力した同期信号（HD，VD信号など）に同期させたRGB，VBS出力信号が得られます。INTERNAL(内部同期モード）に設定すると内部で発生している同期信号を外部へ出力することができます。

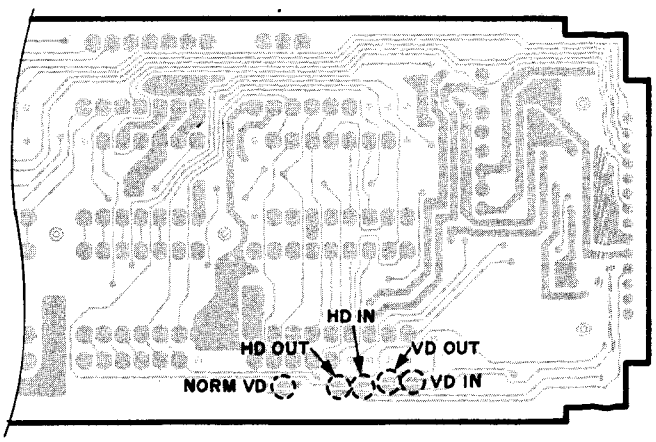
設定は，MB-222基板のジャンパーランド「HD IN」「HD OUT」「VD IN」「VD OUT」で行います。

EXTERNALに設定する場合は，「HD IN」「VD IN」をショートし，「HD OUT」「VD OUT」をオープンにします。

INTERNALに設定する場合は，「HD IN」「VD IN」をオープンにし，「HD OUT」「VD OUT」をショートします。工場出荷時は，外部同期モード（EXTERNAL）に設定されています。

（2-8頁の2-3-2. HD，VDモードも参照して下さい。）

MODE / ジャンパー	EXTERNAL	INTERNAL
HD IN	ショート	オープン
VD IN		
HD OUT	オープン	ショート
VD OUT		



MB-222A BOARD A SIDE

第3章
回路概説

3-1. CCDの動作原理

CCD (Charge Coupled Device＝電荷結合ディバイス) は，規制正しく配列されたMOS (Metal-Oxide-Semiconductor) キャパシターによって構成されています。MOSキャパシターは電荷を扱うための3つの基本的な機能を持っています。

1. 光電変換 (フォトセンサー)
入射光は，MOSキャパシターで電荷を発生させます。このとき発生する電荷量は，光の明暗に比例します。

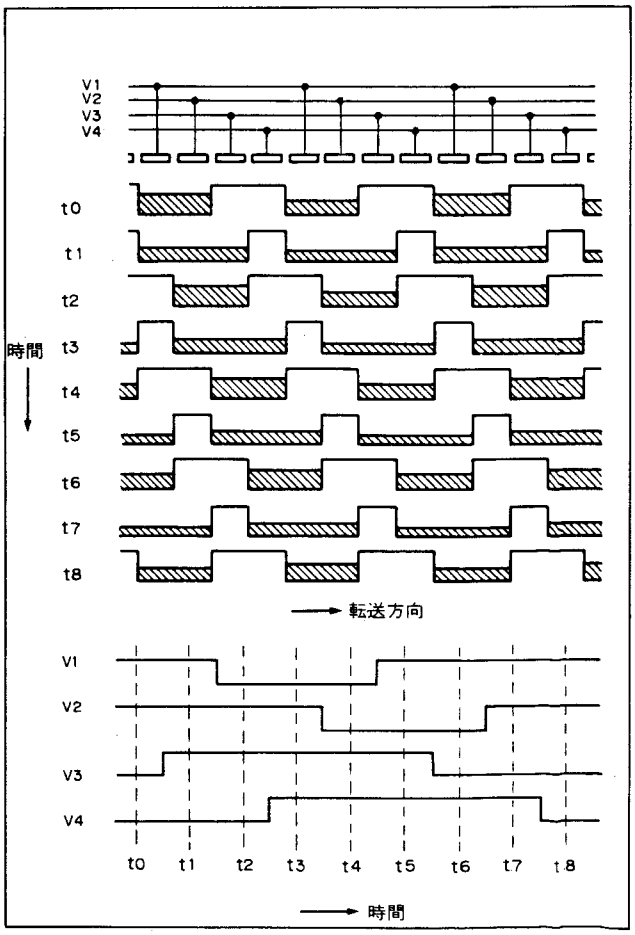
2. 電荷蓄積
MOSキャパシターの電極に電圧がかけられると，シリコンの層の中の電位の井戸が作られます。電荷はこの井戸に蓄えられます。

3. 電荷の転送
高い電圧が電極にかけられるとより深い井戸が作られ，また低い電圧では，浅い井戸が作られます。
電荷の転送は，この特性を利用して行われます。電極に高い電圧を加えると，深い電位の井戸ができて，隣の井戸にたまっていた電荷が流れこんできます。これが規則的に並んだ電極に次々繰り返されると，電荷は1つのMOSキャパシターより次のMOSキャパシターへと移っていきます。これがCCD電荷転送の原理です。

3-2. CCDの電荷転送の機構

XC-711が採用しているインターライン転送方式は，CCD上に結んだ像の明暗に対応した電荷を，3-2頁の〔図3〕のように順次転送して行くものです。フォトセンサー (感光素子) で検知した被写体の明暗に対応した電荷は，まず，それぞれ隣りの垂直転送部に転送され，垂直転送部に移った電荷は，垂直方向に順次，水平転送部へ送られます。水平転送部に移された電荷は，水平方向に順次転送され，出力部から出力されます。

1. 垂直転送
垂直転送部は，4相駆動で電荷を転送しています。〔図1〕に，各時刻での電位の井戸の様子を示します。
t0の時間の状態をみると，電極電圧は (V1＝V2) > (V3＝V4) となっていますので，電圧が高いV1とV2の電極の部分は井戸が深くなり，この深い部分に電荷が蓄えられています。
時刻t1では，電極電圧が (V1＝V2＝V3) > (V4) となり，V1とV2とV3の井戸に電荷が蓄えられます。
時刻t2では，電極電圧が (V2＝V3) > (V4＝V1) となり，V2とV3の井戸に電荷が蓄えられます。
時刻t3以降の電極電圧の状態を次に示します。
時刻t3　(V2＝V3＝V4) > (V1)
時刻t4　(V3＝V4) > (V1＝V2)
時刻t5　(V4) = (V1＝V2＝V3)
時刻t6　(V4＝V1) > (V2＝V3)
時刻t7　(V4＝V1＝V2) > (V3)
時刻t8　(V1＝V2) > (V3＝V4) 〔時刻t0の状態と同じ〕
この動作を次々に繰り返して垂直転送が行われます。



〔図1〕垂直転送

2．水平転送

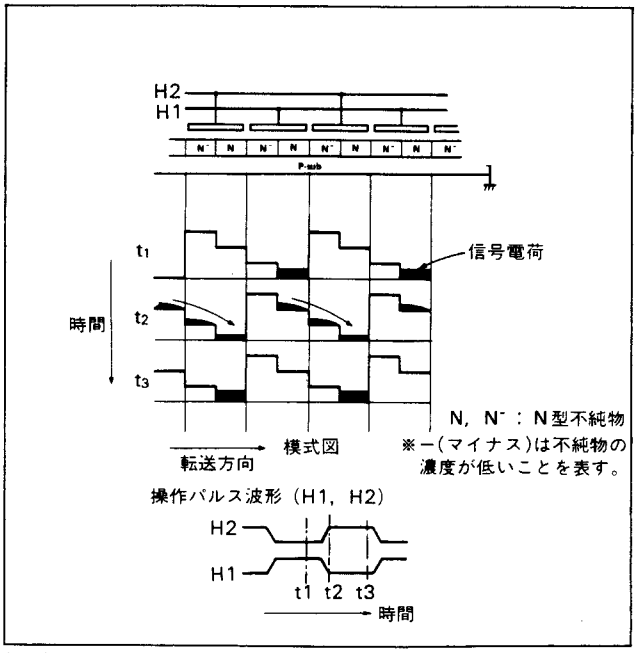
水平転送部は，2相駆動で電荷を転送しています。〔図2〕に各時間での電位の井戸の様子を示します。

時刻t1の状態をみると，電極電圧はH1＞H2となっていますので，電圧が高いH1の電極の部分は井戸が深くなり，この深い井戸の部分に電荷が蓄えられています。

時刻t2の状態では，H1，H2の電圧が反転しており，H2の井戸は深く，H1の井戸は浅くなり，H2の井戸がH1の井戸よりも深くなるので信号電荷は，深いH2の井戸の方へ流れ込みます。

時刻t3の状態では，電極電圧は変化していないから，信号電荷は，H2の井戸へ流れ込み1つの電荷転送が完了します。

この動作を次々に繰り返して水平転送が行われます。



〔図2〕水平転送

3-3．BI-26基板

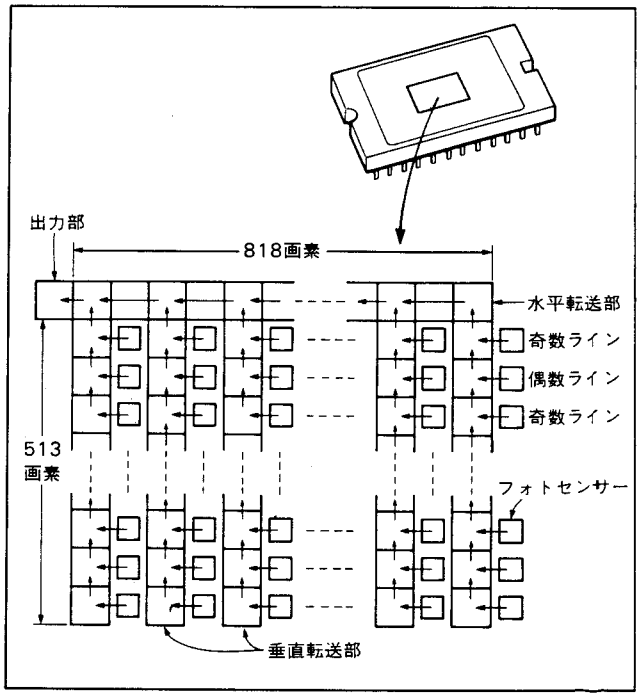
カメラレンズを通して来た光りは，BI-26基板のIC1（CCD）のチップ面に当たります。

CCDチップの表面には，フォットセンサー（感光素子）が配置されています。フォトセンサーは水平方向に818個，垂直方向に513個，合計419,634個あります。この内の水平方向に768個，垂直方向に493個，合計378,624個が有効画素です。有効画素上には，R（赤），G（緑），B（青）のカラーフィルターが縦ストライプ状に構成されていて，ここを通過することで色分解された入射光はフォトセンサー部で光の明暗に対応した電荷に変換されます。

変換された電荷は，フォトセンサーか転送部に読み出され，その後順々に転送され出力部へ導かれます。

転送部には，垂直転送部と水平転送部があります。垂直転送部は〔図3〕に示すように，画面の垂直方向に818本あります。また，水平転送部は画面（〔図3〕の最上部）の水平方向に1本あります。フォトセンサーで変換された電荷は，1フィールド（VDの周波数）毎に各フォトセンサーに隣接した垂直転送部に移されます。各垂直転送部に移された電荷は，垂直転送クロックV1，V2，V3，V4（HDの周波数f_H）で，並列に垂直方向へ転送され，順次，水平転送部に移されます。水平転送部は，水平転送クロックH1，H2（周波数910f_H）で，電荷を水平方向へ転送し，出力部に送ります。

IC1からの出力は，出力部のコンデンサーで電荷を電圧信号に変換してから出力され，Q1のバッファを通った後に，PR-122基板へ送られます。尚，IC2は，水平クロクドライバー，Q2～Q7は読み出した電荷を1画素毎にリセットをするPGドライバーです。



〔図3〕CCDインターライン転送方式

3-4. PR-122基板

この基板には，CCD出力信号から，RGBの色信号をデコードして色差信号と輝度信号を形成する機能があります。また，RGB信号に対しては，ホワイトバランス，γ補正を行うことができます。色差信号に対しては，HUE補正を行うことができます。

BI-26基板からのCCD出力信号は，CCD出力信号に特有のノイズ成分を除去するために，まず，IC1内の相関二重サンプリング方式によるサンプルホールド回路を通ります。その後，2本に分岐します。一方は，IC1内で適当に増幅した後，Q1，Q2，Q3と通り，レンズの絞り（IRIS）を制御するための信号として出力されます。他方は，IC1内のAGC回路を通り2本に分岐します。一方は，オートゲインを検出して，IC1内のOPアンプ1とQ5，Q6で構成するAGC検波回路を通ってYC-38基板へMB-222基板を介して出力（DET DC）されます。他方は，R3を通ってからIC1内の色別サンプルホールド回路にてRGBの各色信号をデコードしてIC1から出力します。

AGC回路のゲインは，YC-38基板から送られてくるDC電圧（AGC CTL）によって決定しますが，調整などでYC-38基板が抜かれていて無い場合は，IC3から出力されるDC電圧によって決定します。

IC1から出力されたRGBの各色信号は，CRによるLPFを通ってからIC2に入力され，2系統に分岐します。一方は，ホワイトバランス回路へ，他方は，輝度バランス回路に入力されます。

ホワイトバランス回路は，MD-61基板で生成されるDC電圧（R CONT，B CONT）により制御されます。

ホワイトバランス回路を通ったRGBの各色信号は，γ補正回路を通り，マトリクス演算回路にて，R-Y，B-Yの色差信号を形成します。この色差信号は，HUE補正回路を通った後，IC2から出力されます。尚，γ補正モードがγOFFであれば，γ補正回路，マトリクス演算回路，HUE補正回路はバイパスされRGB信号がそのまま出力されます。

輝度バランス回路を通ったRGBの各色信号は，更に2系統に分岐します。一方は，輝度バランス（R＝G＝B）したY_H信号形成し，他方は，マトリクス演算回路にてY_L信号を形成します。その後，Y_H信号及びY_L-Y_H信号としてIC2から出力します。尚，γ補正モードがγOFFであれば，Y_HはY_Lとして，Y_L-Y_HはG成分として，出力されます。

IC2から出力されたY_L-Y_H信号は，アクティブLPF（Q7，Q8）を通り，Y_H信号と共にEN-72基板へMB-222基板を介して出力されます。また，色差信号は，バッファ（R-Y；Q19，B-Y；Q20）を通ってから，MD-61基板とEN-72基板へMB-222基板を介して出力されます。但し，EN-72基板への出力は，アクティブLPF（R-Y；Q11とQ12，B-Y；Q9とQ10）によって帯域制限をした後に出力されます。

3-5. MD-61基板

この基板には，色差信号とG信号からRGB各信号を再生する機能とホワイトバランス回路(PR-122基板)の制御信号を生成する機能があります。

・ＲＧＢ各信号の再生回路

PR-122基板から送られてきた色差信号とG信号は，それぞれ反転増幅後，リニアマトリクス演算回路によってR信号とB信号を再生します。IC1からはR信号IC5からはB信号が出力されます。G信号は，反転増幅する前に分岐（Q10のエミッタから）します。

このようにして再生したRGB信号をアナログスイッチIC3の「0」群へ入力します。一方，γ補正モードがγOFFの場合は，PR-122基板から送られて来た色差信号（R-Y，B-Y）とG信号を直接IC3の「1」群へ入力します。

IC3は，EN-72基板のSW1で設定したγ補正モードによって切り換わります。γONの場合は「0」群，γOFFの場合は「1」群が選択されます。

IC3から出力された「0」あるいは「1」群の各信号は，それぞれ増幅された後，クロックノイズを除去するために，4.77MHzのトラップ付きLPFをそれぞれ通り，RD-14基板へMB-222基板を介して出力されます。

・ホワイトバランス制御信号生成回路

この回路は，ホワイトバランスを行うための色温度に応じて，次の3種類のモードを持っています。

a. プリセットホワイトバランス〔3200°K〕モード

被写体の色温度が3200°Kの時に，ホワイトバランスがとれるように，R47～R50によって，プリセットされています。

b. プリセットホワイトバンス〔5600°K〕モード

被写体の色温度が5600°Kの時に，ホワイトバランスがとれるようにRV5，RV6によってプリセットされています。尚，RV5，RV6を調整して，色温度を2600°K～9000°Kの範囲でプリセットしなおすことができます。

c. オートホワイトバランスモード

PR-122基板から送られてきたホワイトバランス検出用信号（DET R，DET G，DET B）をそれぞれピークホールドした後，Gの検波電圧に対してRとBの検波電圧をIC2において，比較演算します。

この演算結果に差があればIC2の出力は変化します。Gの検波電圧の方が小さい場合，IC2の出力(R；7番ピン/B；1番ピン）が大きくなり，PR-122基板のIC2内のホワイトバランス回路中のRあるいはB信号のアンプゲインを下げていきます。(このアンプゲインは，印加電圧に対して反比例の関係になっています。)

このようにして，被写体の色温度に応じて自動的にホワイトバランスをとることができます。

RV2は，Rの検波電圧出力，RV4はBの検波電圧出力のオフセット調整をするためのものです。

これらの3種類のホワイトバランス制御信号は，アナログスイッチIC4に入力されます。IC4は，EN-72基板のSW1で設定したホワイトバランスモードによって切り換わります。

モード	EN-72基板SW1	
	SW1-2	SW1-3
a	OFF	OFF
b	OFF	ON
c	ON	OFF/ON

IC4の出力は，PR-14基板へMB-222基板を介して出力されます。

3-6. RD-14基板

この基板では，MD-61基板から送られてきたRGB信号と，TG-48基板から送られてきたSYNC信号を外部へ出力できるよう信号処理を行います。
RGB信号がそれぞれ信号処理IC1～IC3に入力されます。（このICは，ビデオ信号処理用のものですが，この基板では，その輝度系の処理を利用しています。）
各ICでは，輪隔補正，レベル増幅，ホワイトクリップ，セットアップ付加など行ってから出力します。
更に，ビデオアンプIC4～IC6を通った後，CN-295基板へMB-222基板を介して出力されます。
また，SYNC信号は，2本に分岐され，2通りの方法でCN-295基板へ送られます。一方は，G信号にSYNC信号を付加して出力するG ON SYNCモードです。これは，IC2に対してSYNC信号を入力することで行われます。このとき，RV12でSYNCレベルを調整します。
他方は，SYNC信号を単独で出力します。これは分岐したSYNC信号をバッファ（Q1）した後，R16，R17で分圧し，Q2～Q5のドライブバッファを通した出力です。このときのSYNC出力レベルは，0.3Vp-pですが，R16をショートすることにより，2Vp-pにすることができます。

3-7. EN-72基板

この基板は，PR-122基板から出力された輝度信号（Y_H，Y_L-Y_H）と色差信号（R-Y，B-Y）からVBS信号を作成するエンコーダ基板です。また，このエンコーダ用の各同期信号，クロックを発生する信号発生回路と，γ補正モード，ホワイトバランスモードを設定するスイッチ（SW1）があります。
Y_H信号は，4.2MHzの帯域制限をLPFで行ってからIC2へ入力されます。また，Y_L-Y_H信号は，アナログスイッチIC1を介してからIC2入力されます。Y_H信号は，輪隔補正回路を通った後，Y_L-Y_H信号と加算されY信号となります。このY信号は，視覚特性を重視した低域成分と解像度を重視した高域成分とで構成されています。Y信号は更に，レベル増幅，ホワイトクリップ，セットアップ付加の信号処理を行った後，エンコード回路へ向います。一方，R-Y信号とB-Y信号は，そのままIC2へ入力されクランプ，平衡変調が行われた後，バースト信号と共に加算してクロマ信号となります。尚，この平衡変調は，オートキャリアバランス機能によって，無調整回路でありながら安定したキャリアバランスを得ることができます。
クロマ信号は，一度IC2から出力され，L6，C45によるBPFを通って再びIC2へ入力されます。この時，クロマ信号をBPFに通す前で分岐してYC-38基板へ出力することもできます。再びIC2入力されたクロマ信号は，エンコード回路でY信号と合成されVBS信号となり，IC2から出力されます。その後，2本に分岐され一方は，ビデオアンプIC3を通ってCN-295基板へMB-222基板を介して出力されます。他方は，そのままYC-38基板へMB-222基板を介して出力されます。このとき，Y信号自身もIC2から出力されているので，VBS信号の代りにYC-38基板へ出力することもできます。IC1は，γ補正モードに合わせたレベル増幅をIC2で行うため，制御電圧を切り換えます。γONの場合は，RV1，γOFFの場合はRV2で分圧した電圧が出力されます。
また，γOFFの場合に，アナログスイッチQ4がONとなり，IC2からクロマ信号を出力しないようにします。VBS信号出力もクロマ成分が含まれず，輝度成分のみとなります。
IC6は，IC2で必要なタイミングパルスを発生する同期信号発生器です。TG-48基板のIC4をマスター側とし，EN-72基板のIC6をスレーブ側としたダブルSYNCジェネレータ構成になっています。
マスター側から，送られてくるSYNC信号（M SYNC）をIC4に入力し，Hリセットパルス，Vリセットパルスを作成します。Hリセットパルスは，IC5によって位相調整した後，IC6へ入力します。Vリセットパルスは，そのままIC6へ入力します。また，IC6をマスターSYNCジェネレータに対するスレーブSYNCジェネレータにするため，IC4のEXT/$\overline{\text{INT}}$信号をIC6のEXT端子へ入力します。
また，IC2の4FSC入力には，TG-48基板から送られてきたCLKをIC6内で反転したものを入力します。

3-8. YC-38基板

この基板には，Y/Cセパレート出力に対応するためのYアンプ，Cアンプがあります。また，PR-122基板のAGC回路用の制御電圧を設定し出力する回路があります。
Y/Cセパレートモードに設定されている場合に，Y信号とC信号がEN-72基板から送られてきますが，設定されていない場合，Y信号ではなくVBS信号が送られてきます。このときC信号は送られてきません。
IC1がY信号のビデオアンプです。IC2がC信号用のビデオアンプです。それぞれの出力は，CN-295基板へMB-222基板を介して出力されます。
この基板から出力されているINHIBIT信号は，PR-122基板のアナログスイッチIC3をディセーブルにして，カメラゲインの設定をYC-38基板で行えるようにします。RV3～RV6はゲイン制御電圧を設定します。DET DC信号は，AGCモードにおけるゲイン制御電圧信号です。これらを，SW1の設定によって，アナログスイッチIC3において切り替えます。IC3の出力（AGC CTL）は，PR-122基板へMB-222基板を介して送られます。

3-9. CN-295基板

この基板は，リアパネルの各コネクタと一体になった基板です。外部との信号のやり取りを全てここで行います。
9ピンDSUBコネクタからは，RGB信号，SYNC信号，VBS信号（または，輝度信号/クロマ信号）が出力されます。
BNCコネクタからは，VBS信号（または輝度信号）が出力されます。12ピンマルチコネクタでは，電源（+12V）や外部同期信号（EXT HD，EXT VDあるいは，VBS，VS）の入力，また，VBS信号や同期信号（CLK，HD，VD）の出力が行われます。
4ピンフィメールコネクタからは，オートアイリス付きのレンズ用の電源（+12V），検出用ビデオ信号を出力します。
詳しくは第1章の「1-3. 各部の名称と使いかた」を参照して下さい。

3-10. MB-222基板

この基板には，外部同期信号分離回路，内部同期信号出力用バッファ，DC-DCコンバータなどがあります。
また，マザーボードとしての役目もあります。

・外部同期信号分離回路
EXT VDラインには，外部からVBS信号，VS信号あるいは，VD信号が入力できます。VBS信号またはVS信号の場合，バッファQ2を通り，R31，C19によるLPFによって，クロマ成分を抑圧します。そしてQ3によって信号中のSYNC部分が分離，検出されます。このSYNC信号をIC1で波形整形後，TG-48基板へ出力（EX VD）します。VD信号の場合は，充分な振幅があるため，単なる波形整形回路として働きます。無信号時は，Highレベルになっています。
EXT HDラインには，外部からHD信号が入力できます。HD信号はバッファQ1を通り，IC1で反転波形整形後，TG-48基板へ出力（EX HD）します。無信号時はLowレベルになっています。

・内部同期信号出力用バッファ
TG-48基板から送られたVD信号，HD信号，CLK信号をここでバッファした後，CN-295基板へ出力します。Q4がVD信号用，Q5がHD信号用，そしてQ6がCLK信号用のバッファです。尚，VD信号とHD信号は，内部同期モードに設定しなければCN-295基板へ出力できません。
きません。

・DC-DCコンバータ
外部から供給された電源（+12V）は，DC-DCコンバータによって−5V，+5V，+7V，+15V，+25Vの電源電圧に変換され各基板に供給されます。

3-11. TG-48基板

この基板には，各種の外部同期モードにも対応できる同期信号発生回路とCCDの駆動および信号処理のためのタイミングパルス発生回路があります。
IC4は，外部同期信号の有無を検出し，信号が入力されていれば自動的に外部同期モードに切り換わります。そして，この信号に同期した各種同期信号を発生します。

SYNC　　；コンポジットSYNC信号（マスターSYNC）
BLK　　；ブランキング信号
HD，VD　；水平，垂直同期信号
FLD　　；フィールド識別信号
$\overline{\text{INT}}$/EXT　；同期モード識別フラグ

28MHz発振回路は，LC発振と水晶発振の2つがあります。外部同期モードの場合，LC発振回路が動作します。このLC発振回路はVCOとなっていて，IC4と位相比較器IC6とでPLLを構成しています。このため，外部同期信号に対して完全にロックインしたクロックを出力します。
内部同期モードの場合，水晶発振回路が動作し，28.6363MHzのクロックを出力します。
このどちらかのクロックは，IC4のHD，VD信号と共にIC2へ入力し，CCDの駆動および信号処理のための各タイミングパルスを発生させます。

CLK　　；14MHz（910f_H）のクロック
XPG　　；CCDプリチャージゲート用クロック
XH1，XH2；CCD水平転送用2相クロック
XV1～XV4；CCD垂直転送用4相クロック
SHP，SHD；CCD出力信号に対する二重相関サンプリングパルス

IC1はCCDに付属しているシステムデータ書き込み済ROMです。このうち，CCDのキズ補正用のアドレスが書き込まれているものには，CCDと同じシリアルNo.が貼られています。
IC3はVD信号からWINDOW信号を作成します。

3-12. DR-83基板

この基板には，CCD垂直転送用クロックドライブ回路と電子シャッター制御回路があります。

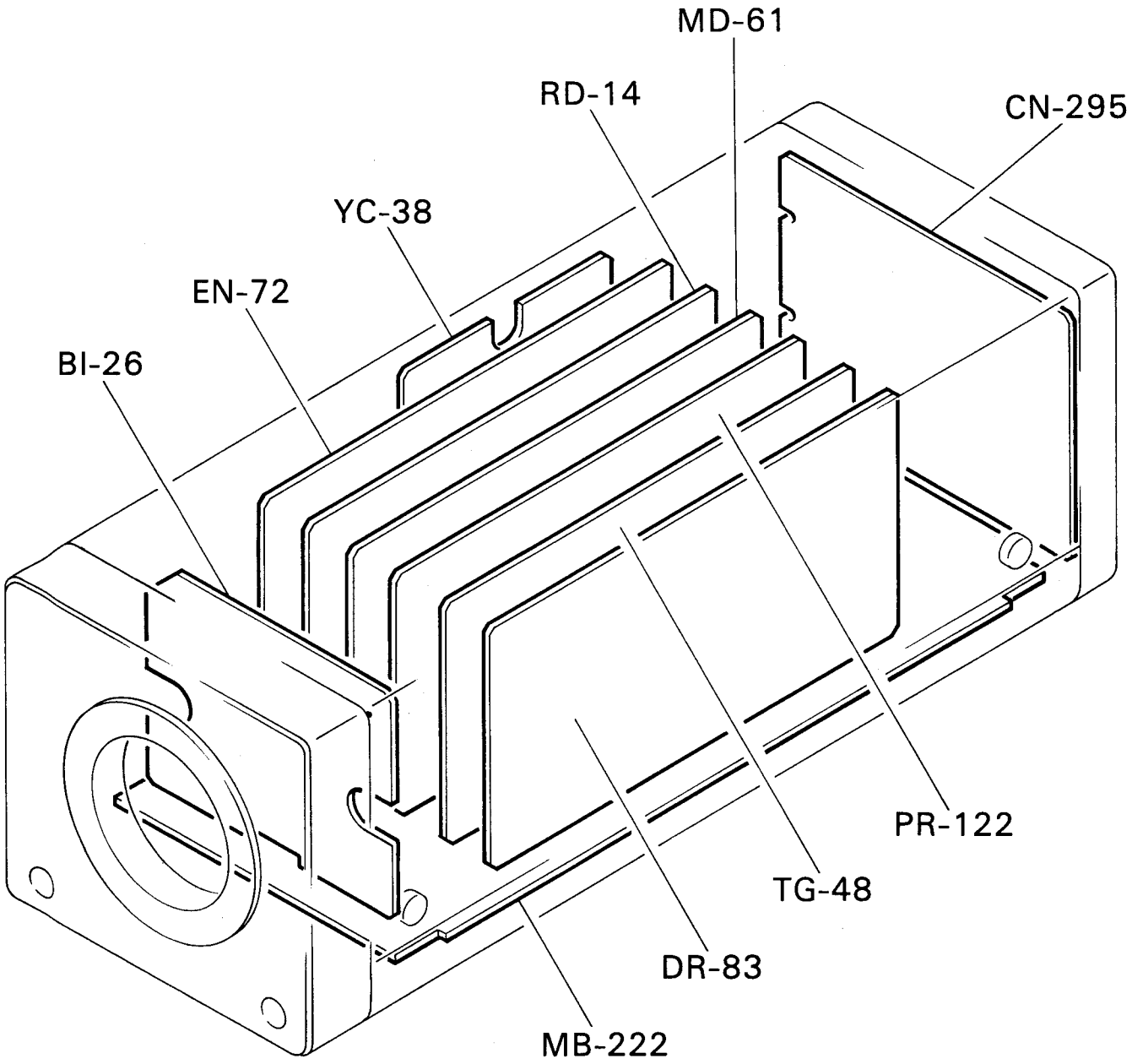
・CCD垂直転送用クロックドライブ回路
TG-48基板から送られてきたXV1～XV4，XSG1，XSG2の各パルスをクロックドライバーIC1で増幅後，CCDの駆動パルスV1～V4を出力します。この駆動パルスは，D7～D9でクランプした後，BI-26基板へMB-222基板を介して出力されます。このときのクランプ電圧は，IC1のVL出力とD6によって作成した負電圧VLです。また，負電圧VLもBI-26基板へMB-222基板を介して出力されます。Q1～Q3は，IC1に必要な電源電圧を作り出すレギュレータです。

・電子シャッター制御回路
TG-48基板から送られてきたXV4，XSG1，PS，HD，VDの各信号を入力して電子シャッター用パルス（XSUB）をIC3で発生します。XSUBは，Q7～Q10のドライブバッファを通り，クランプ（D1）された後，BI-26基板へMB-222基板を介して出力（SUB CTL）されます。このときのクランプ電圧は，Q4～Q6のレギュレータが作り出したものです。また，このクランプ電圧は，CCDのSUB端子への通常バイアス電圧となっています。電子シャッター機能は，このSUB端子へのバイアス電圧をXSUBで変調して行われます。
SW1によって電子シャッターのスピード（電荷の蓄積時間）を設定します。

第4章
調整要項

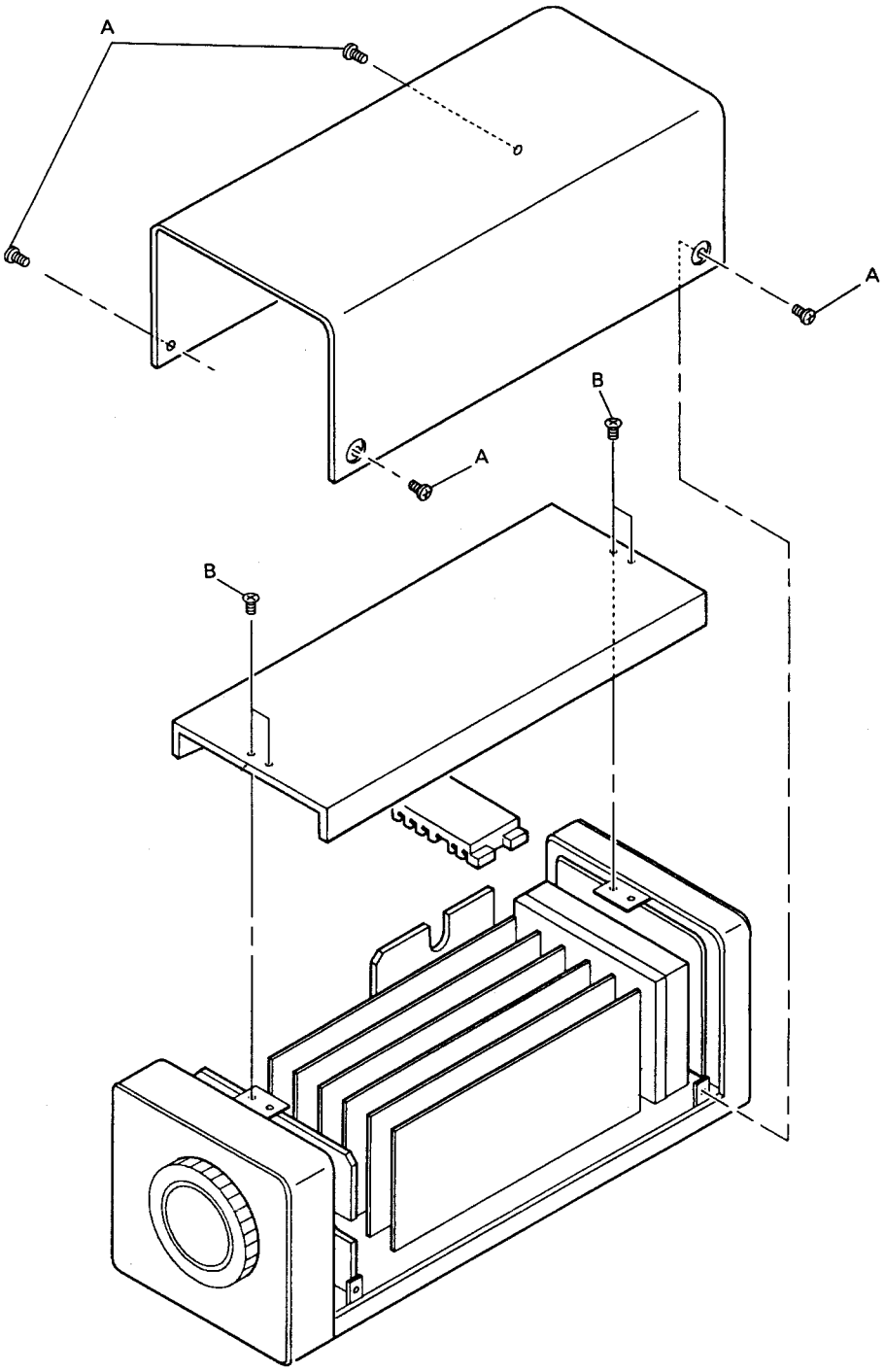
4-1. 調整の予備知識

4-1-1. 基板配置図

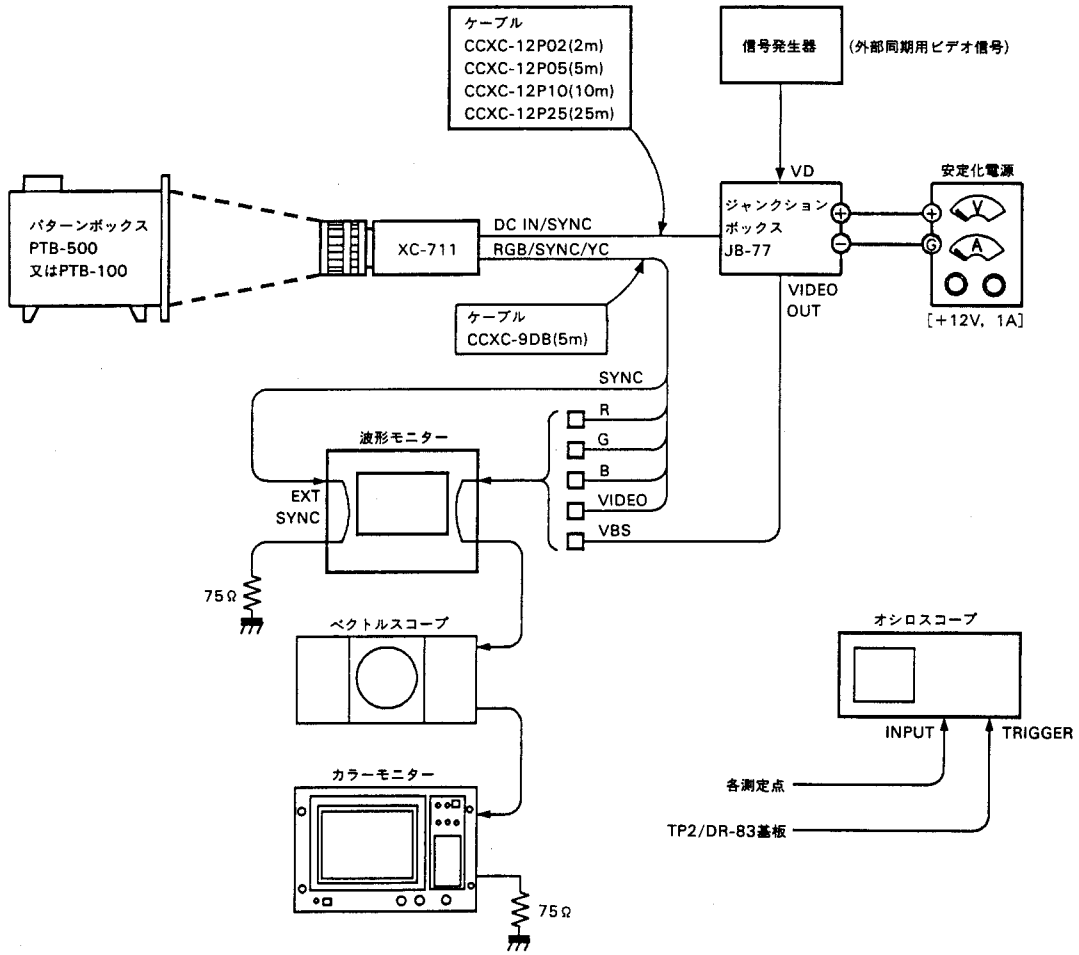


4-1-2. 外装の外し方

ねじA（PRECISION＋P2×4）4本を外しカメラカバーを外します。
ステーをシャーシに止めているねじB（PRECISION＋K2×4）4本を外し，ステーと基板押さえをとります。

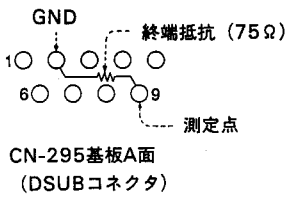


4-1-3. 接続図



・オシロスコープでの終端

4-4-8. Cゲイン調整（YC-38基板）では，測定点を75Ωの抵抗で終端してから波形を観測または，調整を行って下さい。(右図参照)



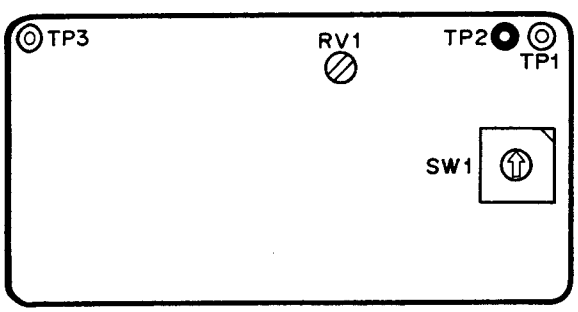
CN-295基板A面
(DSUBコネクタ)

・オシロスコープのトリガー入力

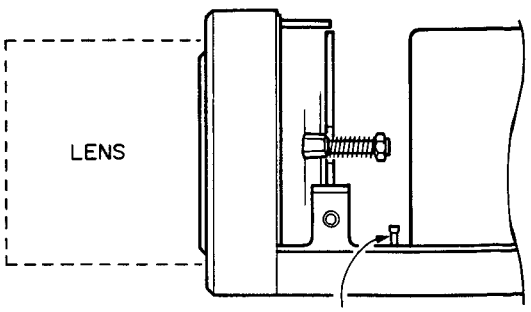
オシロスコープを使って波形を観測する場合，トリガー入力が必要です。

トリガー入力には，HD信号 (TP2/DR-83基板) を入力します。

GNDは，E2/MB-222基板に接続します。



DR-83 BOARD (B SIDE)

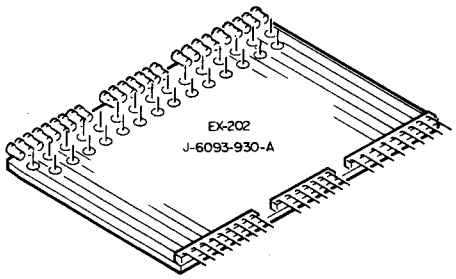


E2/MB-222 BOARD

4-1-4. 調整用治具及び測定器具

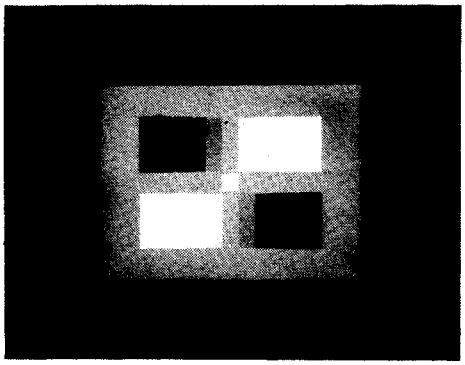
J-6093-930-A	基板延長治具 (EX-202)

・PR-122基板調整用



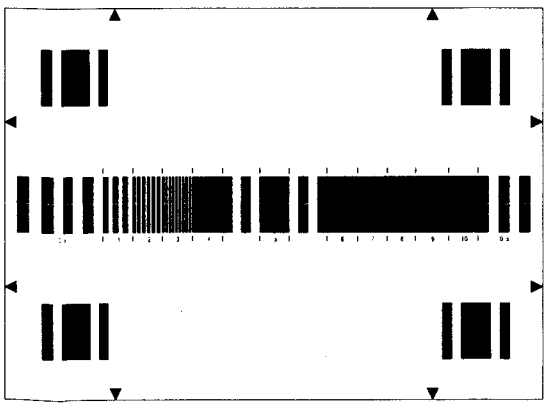
J-6026-130-B	グレースケールチャート

・ビデオレベル及びガンマ調整用等



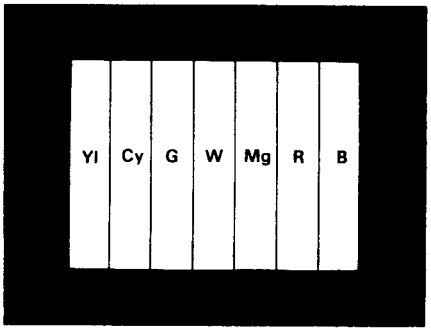
J-6021-910-A	インメガチャート

・アパーチャ調整用



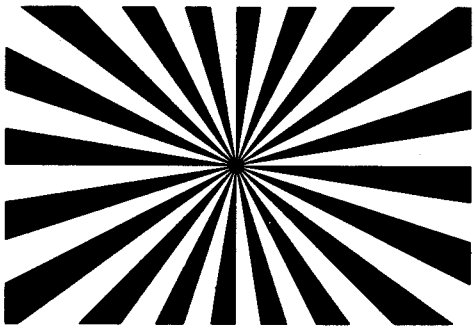
J-6020-250-A	カラーバーチャート

・色調整用

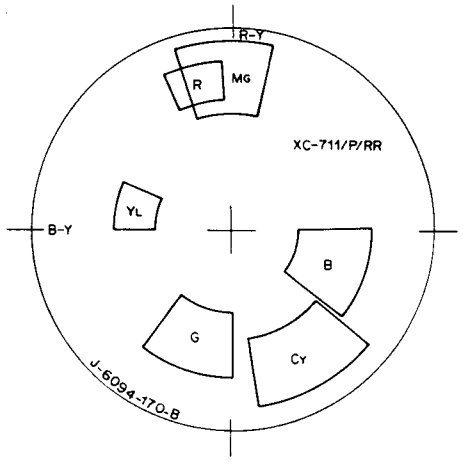


J-6024-340-B	ジーメンススターチャート

・バックフォーカス調整用

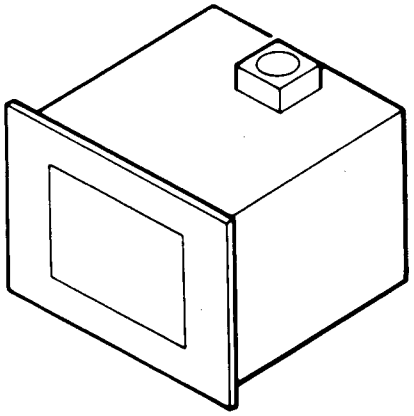


J-6094-170-B	カラー規格枠



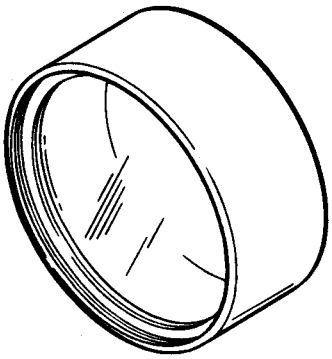
J-6020-490-A	パターンボックスPTB-100
J-6029-140-A	パターンボックスPTB-500

・テストチャート光源用　AC90～130V（PTB-100）
　　AC90～240V（PTB-500）

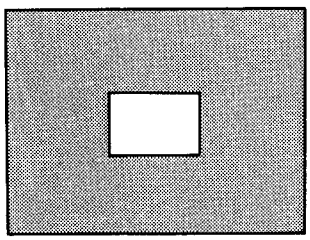


注意：新しく購入する場合は，PTB-500になります。

J-6080-058-A	LB140フィルター
J-6029-590-A	LB200フィルター



ホワイトウィンドウチャート



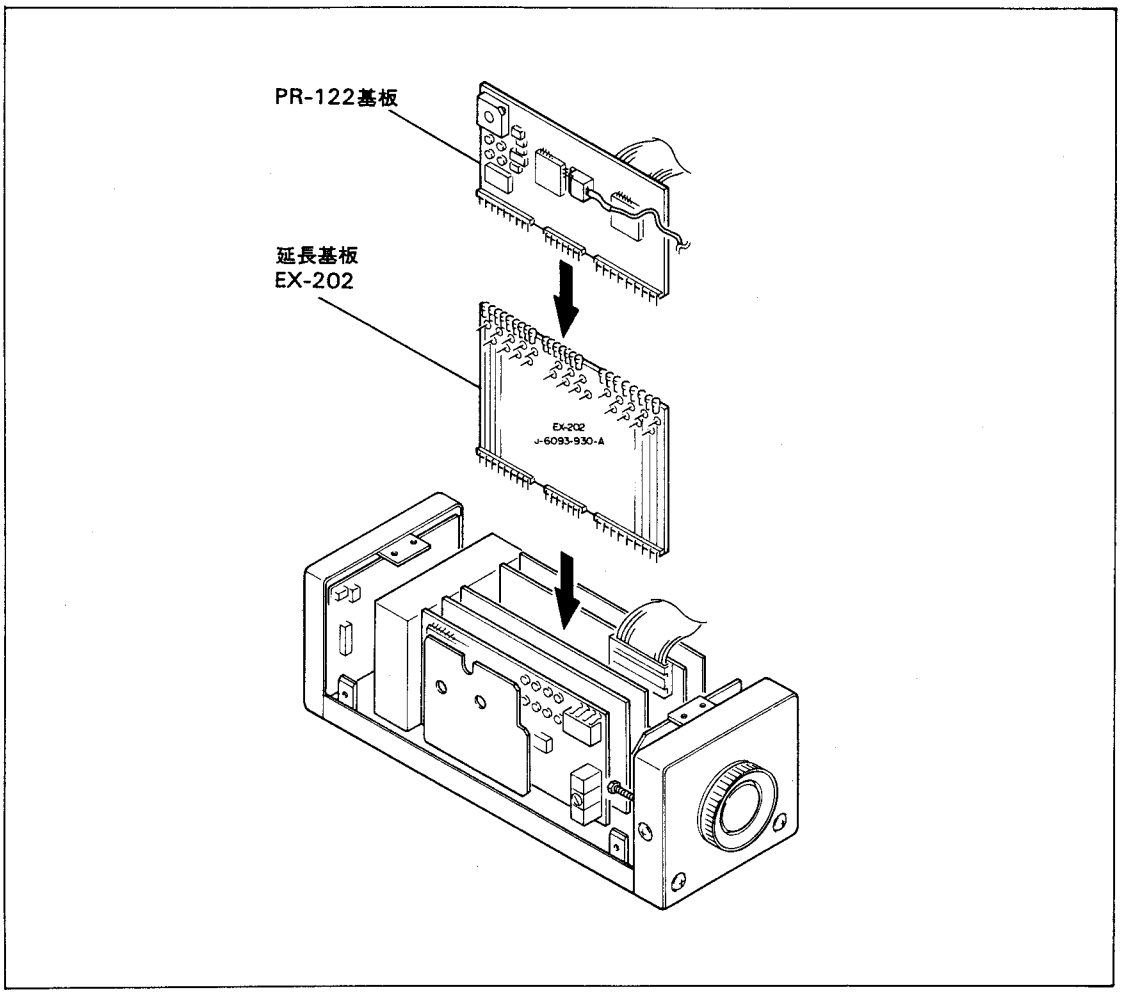
黒い紙の中央付近に穴をあけたもの。

市販品

・二現像オシロスコープ
・ベクトルスコープ
・波形モニター
・周波数カウンター
・デジタル電圧計
・カラーモニター
・レンズ（Cマウントで，手動アイリスのもの）

4-1-5. 延長基板EX-202の取り付け

1. 4-1-2. 外装の外し方を参照して，外装を取り外します。
2. DR-83基板を取り外します。
3. TG-48基板を取り外します。
4. PR-122基板を取り外します。
5. PR-122基板のあった場所に延長基板を取り付けます。
6. PR-122基板を延長基板に取り付けます。



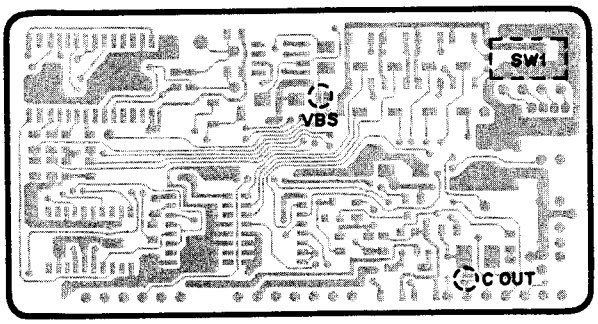
7. TG-48基板をもとの場所に取り付けます。
8. DR-83基板をもとの場所に取り付けます。

NOTE： 延長基板EX-202は，PR-122基板だけでなく，DR-83基板，TG-48基板，MD-61基板，RD-14基板，EN-72基板をも延長することが可能です。

4-2. 調整準備

4-2-1. 初期設定

YC-38基板をMB-222基板から取り外しておきます。又，EN-72基板のジャンパー「C OUT」をショートさせておきます。



EN-72 BOARD B SIDE

それから，PR-122基板を延長基板(EX-202)を介して取り付けます。4-1-5. 延長基板EX-202の取り付けを参照してください。

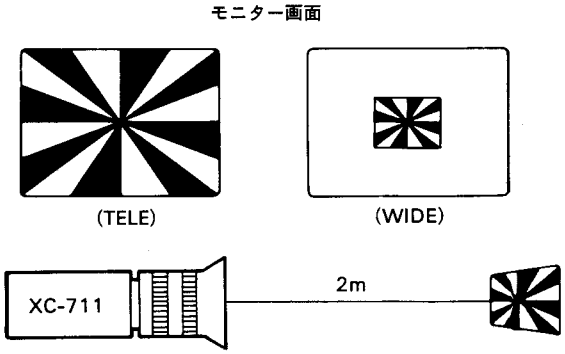
各基板のスイッチを次のように設定します。

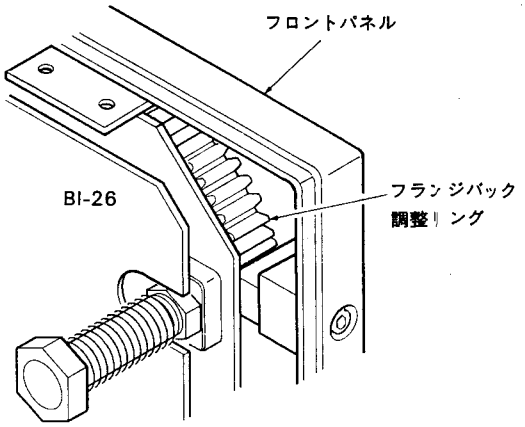
- PR-122基板 SW1……「2」
- DR-83基板 SW1 ……「0」
- EN-72基板 SW1-1 ……「OFF」
  -2 ……「OFF」
  -3 ……「OFF」
  -4 ……「OFF」

4-2-2. フランジバック調整

被写体：ジーメンススターチャート
レンズ絞り：開放
測定器：カラーモニター
測定点：VBS OUT
調整：

1. レンズズームTELE端でジーメンススターチャートを撮像し，Efリングでフォーカスを最良にします。
2. レンズズームをWIDE端に動かし，どのズーム位置でもフォーカスが合っているか確認します。この時，フォーカスリングは絶対回さないで下さい。
3. レンズズームがWIDE端にある時，下図に示すフランジバック調整リングを，最良のフォーカス位置に合わせます。
4. 1～3項を数回繰り返します。





4-3. 基準系

4-3-1. VCO電圧調整

準備：HD信号とVD信号(またはVS/VBS信号)を入力する。
測定器：デジタル電圧計
測定点：TP1（GND：E2/MB-222基板)/TG-48基板
調整箇所：◐CV1/TG-48基板
規格：2.8±0.1V
注意：HD信号とVD信号は，この調整を行う場合のみ必要です。
　　他の調整では，入力しないで下さい。

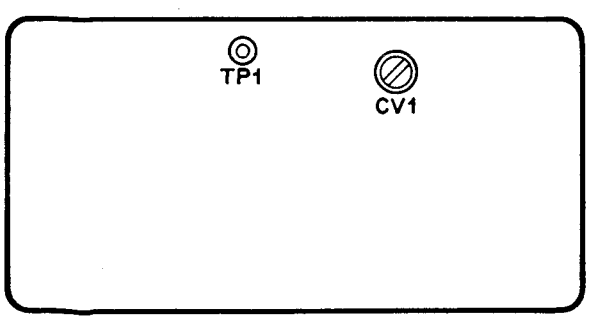
4-3-2. CCDサブストレート電圧調整

測定器：デジタル電圧計
測定点：TP3（GND：E2/MB-222基板)/DR-83基板
調整箇所：◐RV1/DR-83基板
規格：設定値±0.1V

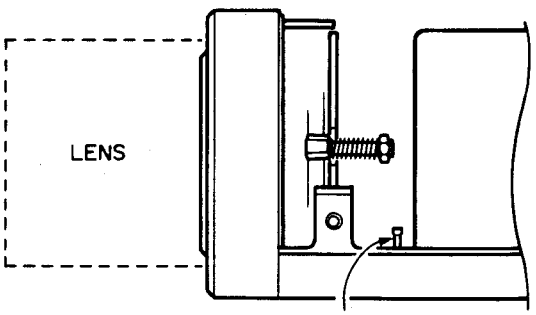
・設定値について
CCD撮像素子を交換した場合は，その新しいCCD撮像素子の裏面に表示されている略号（2桁）を参照します。
CCD撮像素子を交換していない場合は，フロントパネルの内側上に張ってあるラベルの略号を参照します。
尚，CCD撮像素子を交換したときは，フロントパネルの内側に張ってあるラベルの略号を新しいCCD撮像素子の裏面に表示されている略号に必ず訂正しておいて下さい。
略号—2桁表示：　□　□
　　↑　↑
　　整数部　小数部
略号整数部と実際の数値は，以下の対応となります。

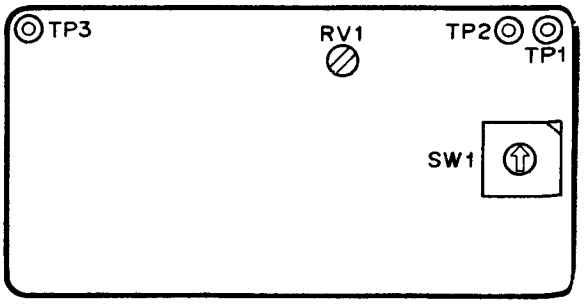
略号整数部	9	A	B	C	D	E	F	G	H	I	J
数　値	9	10	11	12	13	14	15	16	17	18	19

〈例〉 F5→15.5(V)



TG-48 BOARD (A SIDE)





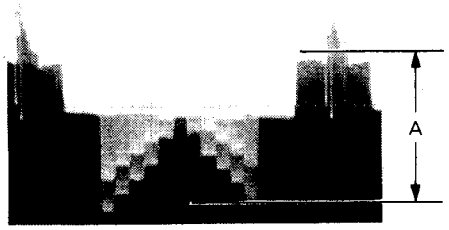
DR-83 BOARD (B SIDE)

4-4. プロセス系

4-4-1. ビデオゲイン調整（PR-122基板）

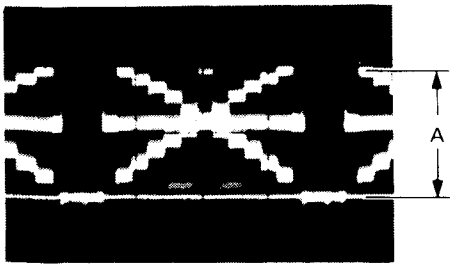
被写体：グレースケールチャート
調整：

1. 測定器：オシロスコープ
   測定点：TP1（GND：9番ピン/延長基板)/PR-122基板
   調整箇所：レンズ絞り
   規格：A＝94±10mV



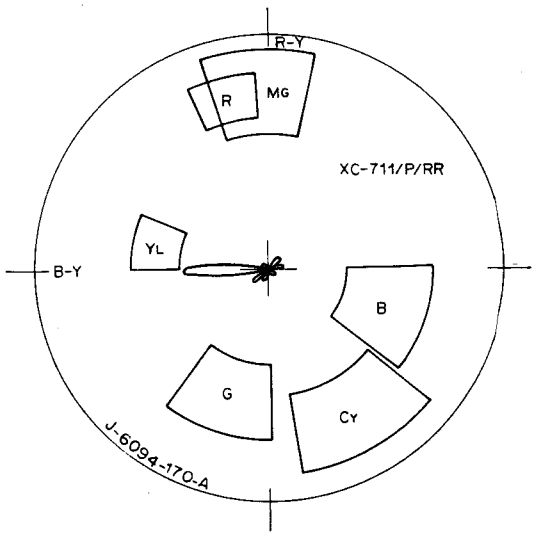
2. 準備：SW1/PR-122基板…「4」
   測定器：オシロスコープ
   測定点：TP2（GND：9番ピン/延長基板)/PR-122基板
   調整箇所：◐RV14/PR-122基板
   規格：A＝1000±40mV

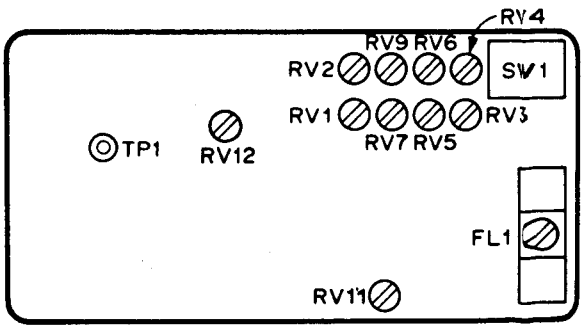
3. 準備：SW1/PR-122基板…「2」
   測定器：オシロスコープ
   測定点：TP2（GND：9番ピン/延長基板)/PR-122基板
   調整箇所：◐RV12/PR-122基板
   規格：A＝250±10mV



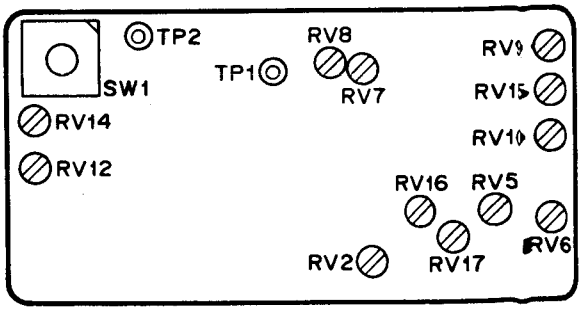
調整2，3

4. 測定器：ベクトルスコープ
   測定点：VBS OUT出力
   調整箇所：◐RV7，◐RV8/PR-122基板（交互に調整）
   規格：輝点がベクトルスコープ画面の中心にある。





EN-72 BOARD (B SIDE)

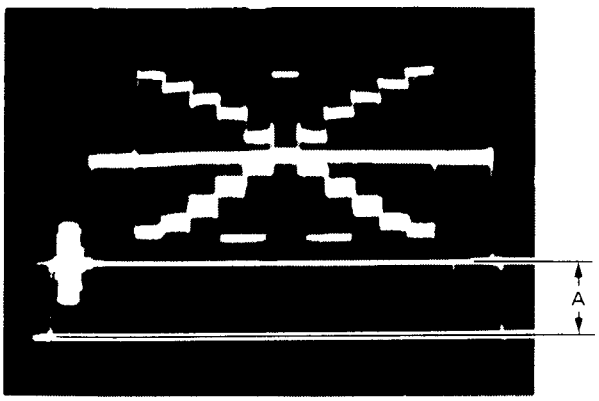


PR-122 BOARD (A SIDE)

4-4-2. SYNCレベル調整（EN-72基板）

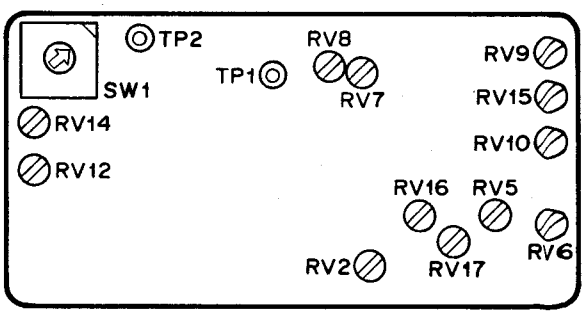
被写体：グレースケールチャート
準備：◐RV9/PR-122基板を左一杯に回す。
◐RV16/PR-122基板を右一杯に回す。
◐RV17/PR-122基板をメカニカルセンターにする。
◐RV4/EN-72基板を右一杯に回す。
◐RV5/EN-72基板を右一杯に回す。

調整：
1. 測定器：波形モニター
測定点：VBS OUT
調整箇所：◐RV7/EN-72基板
規格：A＝40±1IRE

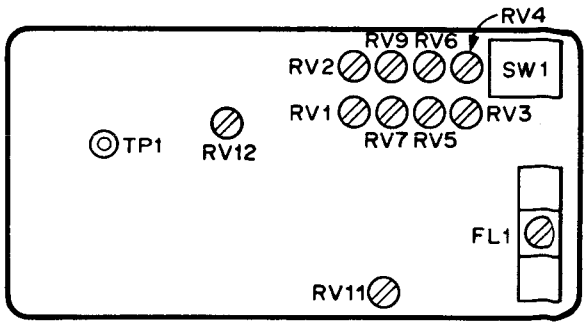


4-4-3. Setupレベル調整（EN-72基板）

レンズ絞り：クローズ “C”
測定器：波形モニター
測定点：VBS OUT
調整箇所：◐RV6/EN-72基板
規格：A＝7.5±1IRE



PR-122 BOARD (A SIDE)

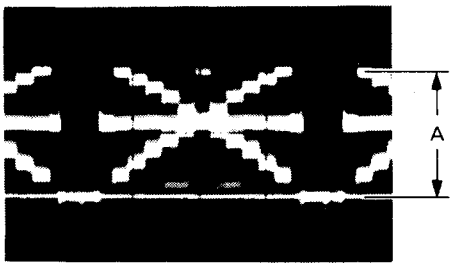


EN-72 BOARD (B SIDE)

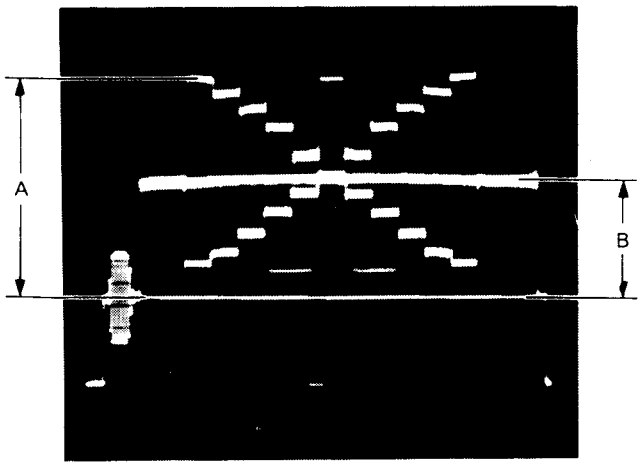
4-4-4. Yレベル調整（EN-72/PR-122基板）

被写体：グレースケールチャート
調整：

1. 測定器：オシロスコープ
   測定点：TP2（GND：9番ピン/延長基板)/PR-122基板
   調整箇所：レンズ絞り
   規格：A＝400±20mV

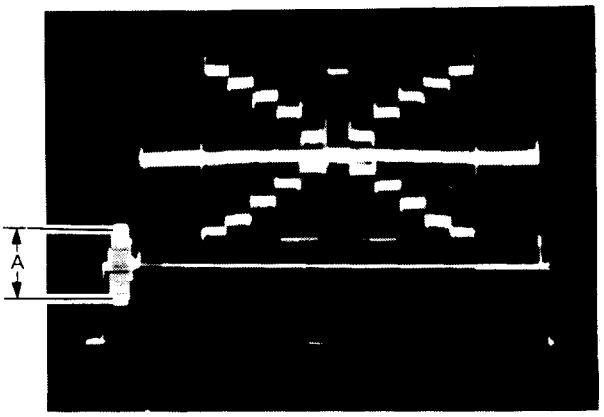


2. 測定器：波形モニター
   準備：SW1-1/EN-72基板…「ON」
   測定点：VBS OUT
   調整箇所1：◐RV1/EN-72基板
   規格1：A＝100±2IRE
   調整箇所2：◐RV17/PR-122基板
   規格2：B＝50±2IRE
   調整箇所1，2を繰り返し調整する。



4-4-5. バーストレベル調整（EN-72基板）

被写体：グレースケールチャート
測定器：波形モニター
測定点：VBS OUT
測定箇所：◐RV11/EN-72基板
規格：A＝40±1IRE



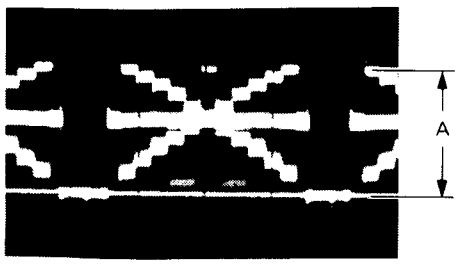
4-4-6. ビデオゲイン調整（YC-38基板）

被写体：グレースケールチャート
測定器：オシロスコープ
測定点：TP2（GND：9番ピン/延長基板)/PR-122基板
調整：

1. 調整箇所：レンズ絞り
   規格：A＝250±10mV

2. 準備：YC-38基板をMB-222基板に取り付ける。
   ※基板の取り付けは，電源をOFF にしてから行って下さい。
   SW1/YC-38基板を切り換えて，測定点のレベルAを下表のように調整する。

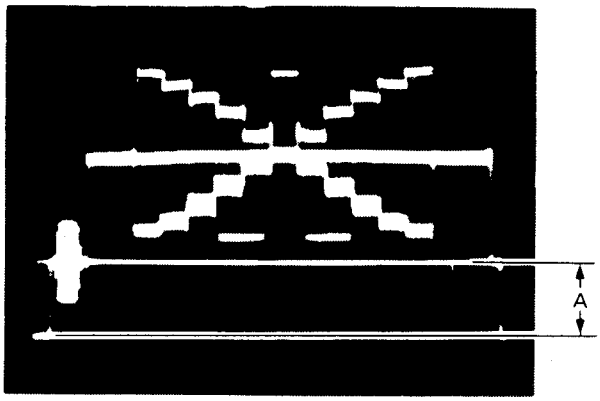
SW1位置	調整箇所	規　格
「0」(AGC)	◐RV2/PR-122基板	A＝400±20mV
「1」(−6dB)	◐RV3/YC-38基板	A＝125±10mV
「2」(0dB)	◐RV4/YC-38基板	A＝250±10mV
「3」(＋6dB)	◐RV5/YC-38基板	A＝500±20mV
「4」(＋12dB)	◐RV6/YC-38基板	A＝1000±40mV

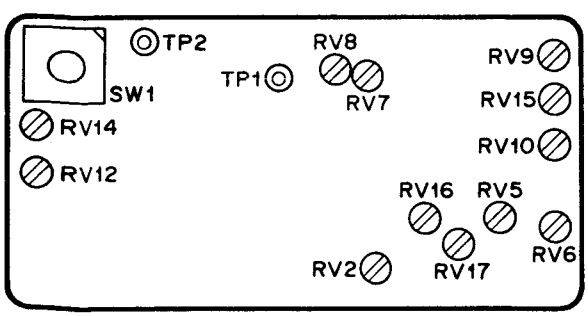


調整1，2

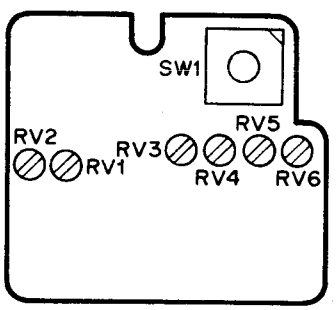
4-4-7. Yゲイン調整（YC-38基板）

準備：SW1/YC-38基板…「2」
被写体：グレースケールチャート
測定器：波形モニター
測定点：ケーブルCCXC-9DBのY OUT
調整箇所：◐RV1/YC-38基板
規格：A＝40±1IRE





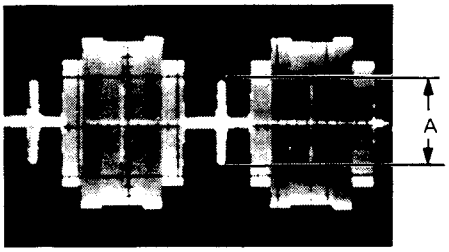
PR-122 BOARD (A SIDE)

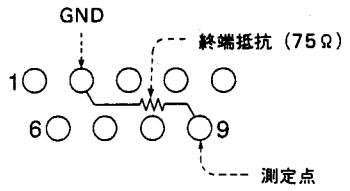


YC-38 BOARD (A SIDE)

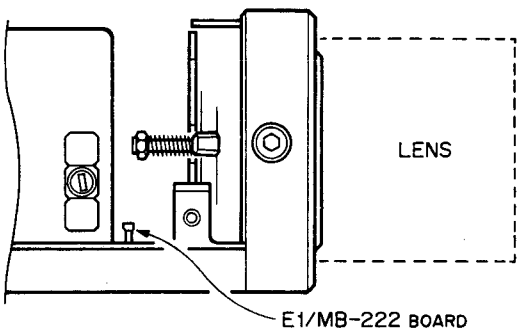
4-4-8. Cゲイン調整（YC-38基板）

準備：SW1/PR-122基板…「2」
被写体：カラーバーチャート
測定器：オシロスコープ（75Ωで終端）
測定点：DSUBコネクタの9番ピン
　　GND：E1/MB-222基板
調整箇所：RV2/YC-38基板
規格：A＝286±7mV





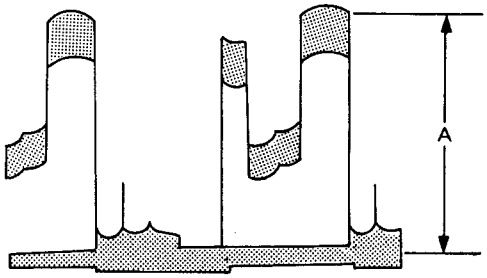
CN-295基板A面（DSUBコネクタ）



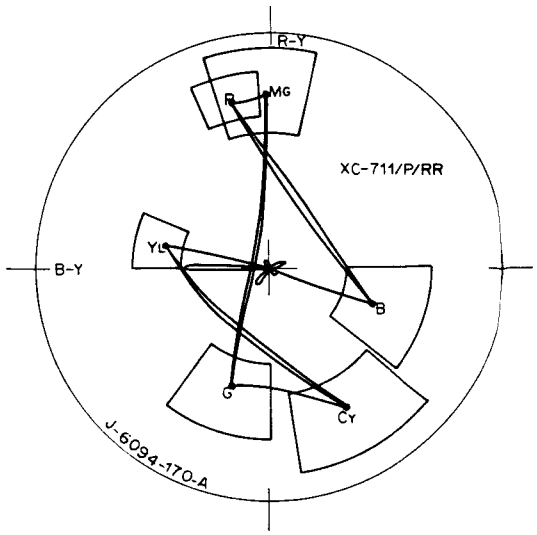
4-4-9. HUE調整（PR-122基板）

準備：SW1/PR-122基板…「2」
被写体：カラーバーチャート
調整：

1. 測定器：オシロスコープ
　測定点：TP2（GND：9番ピン/延長基板）/PR-122基板
　調整箇所：レンズ絞り
　規格：A＝400±10mV



2. 測定器：ベクトルスコープ
　測定点：ケーブルCCXC-9DBのVIDEO OUT
　調整箇所1：◐RV7，◐RV8/PR-122基板（交互に調整）
　規格1：白信号の輝度がベクトルスコープ画面の中心にある。
　調整箇所2：◐RV5，◐RV6，◐RV10，◐RV15/PR-122基板（交互に調整）
　規格2：R，YLの輝度が規格枠内にある。



4-5. RGB系

準備：

1. YC-38基板とEN-72基板をMB-222基板から取り外す。
2. ◐RV2，◐RV4，◐RV7，◐RV10/RD-14基板を全て右一杯に回す。

※ 基板の取り外しは，電源をOFF にしてから行って下さい。

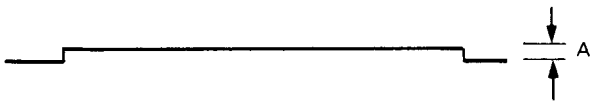
4-5-1. Setupレベル調整（RD-14基板）

レンズ絞り：クローズ “C”
測定器：波形モニター（EXT SYNCモード）
調整：

1. 測定点：ケーブルCCXC-9DBのR OUT
   調整箇所：◐RV5/RD-14基板
   規格：A＝7.5±1IRE

2. 測定点：ケーブルCCXC-9DBのG OUT
   調整箇所：◐RV8/RD-14基板
   規格：A＝7.5±1IRE

3. 測定点：ケーブルCCXC-9DBのB OUT
   調整箇所：◐RV11/RD-14基板
   規格：A＝7.5±1IRE

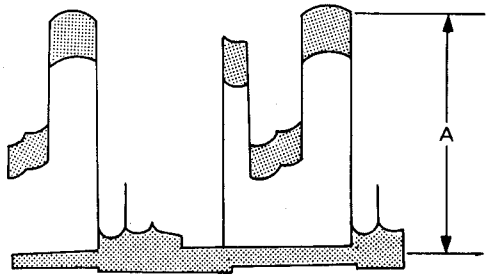


調整1～3

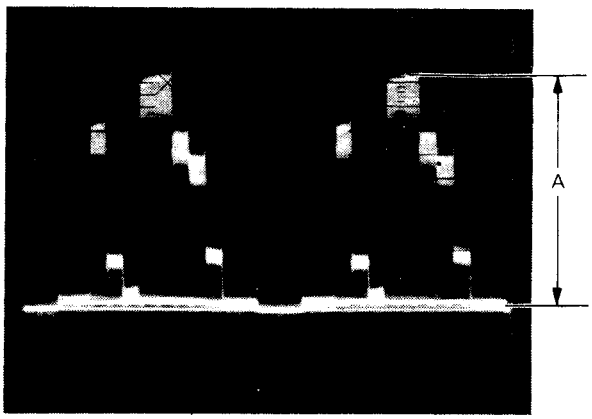
4-5-2. RGBレベル調整（RD-14基板）

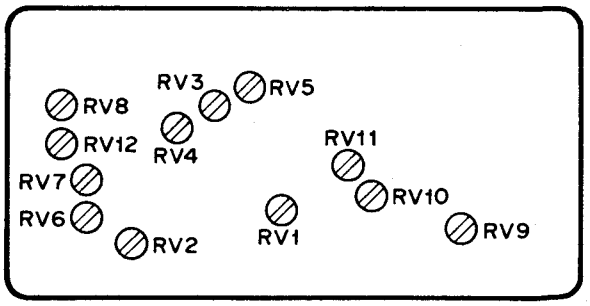
被写体：カラーバーチャート
調整：

1. 測定器：オシロスコープ
   測定点：TP2（GND：9番ピン/延長基板)/PR-122基板
   調整箇所：レンズ絞り
   規格：A＝400±10mV



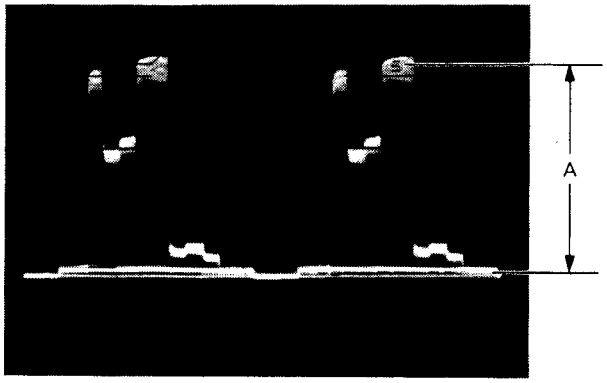
2. 測定器：波形モニター
   測定点：ケーブルCCXC-9DBのR OUT
   調整箇所：◐RV3/RD-14基板
   規格：A＝100±2IRE



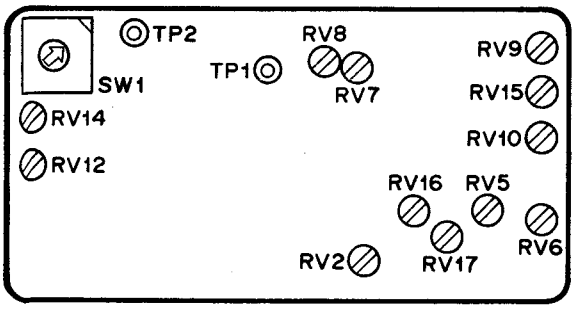


RD-14 BOARD (A SIDE)

3. 測定器：波形モニター
測定点：ケーブルCCXC-9DBのG OUT
調整箇所：◐RV6/RD-14基板
規格：A＝100±2IRE



4. 測定器：波形モニター
測定点：ケーブルCCXC-9DBのB OUT
測定箇所：◐RV9/RD-14基板
規格：A＝100±2IRE



PR-122 BOARD (A SIDE)

4-5-3. アパーチャ調整（RD-14/PR-122基板）

被写体：インメガチャート
測定器：波形モニター（15LINEモード）
測定点：ケーブルCCXC-9DBのG OUT
調整：

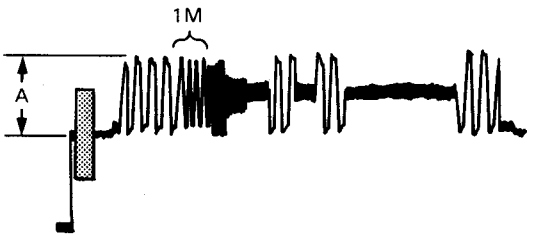
1. 調整箇所：レンズ絞り
規格：0.5MHzの振幅A＝40±2IRE

2. 準備：◐RV2/RD-14基板を左一杯に回す。
調整箇所：◐RV1/RD-14基板
規格：1MHzの振幅A＝80±2IRE

3. 調整箇所：◐RV2/RD-14基板
規格：1MHzの振幅A＝45±2IRE

4. 調整箇所：◐RV1/RD-14基板
規格：1MHzの振幅A＝57±2IRE

5. 調整箇所：◐RV9/PR-122基板
規格：1MHzの振幅A＝55±2IRE・



調整2～5

4-5-4. ホワイトクリップ調整（RD-14基板）

被写体：インメガチャート
レンズ絞り：開放
測定器：波形モニター
調整：

1. 測定点：ケーブルCCXC-9DBのG OUT
   調整箇所：◐RV7/RD-14基板
   規格：A＝110±2IRE

2. 測定点：ケーブルCCXC-9DBのR OUT
   調整箇所：◐RV4/RD-14基板
   規格：A＝110±2IRE

3. 測定点：ケーブルCCXC-9DBのB OUT
   調整箇所：◐RV10/RD-14基板
   規格：A＝110±2IRE

調整1～3

4-6. VBS系

準備：

1. 取り外してあるEN-72基板のジャンパー「C OUT」の半田盛りを取り除く。
2. このEN-72基板とYC-38基板をMB-222基板に取り付ける。
3. EN-72基板とRD-14基板の間にシールド板を入れる。

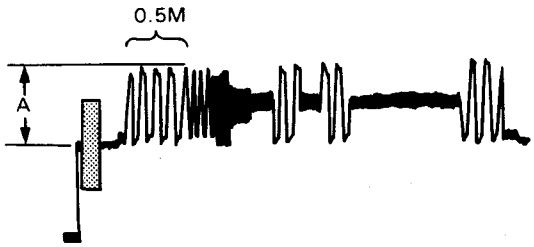
※ 基板の取り付けは，電源をOFFにしてから行って下さい。

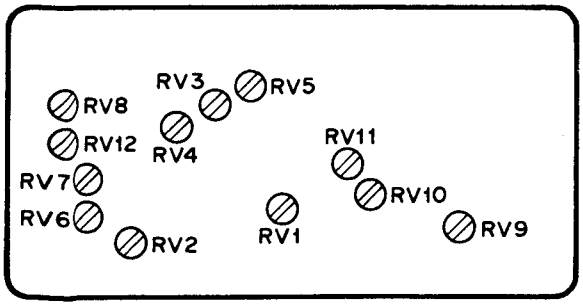
4-6-1. アパーチャ調整（EN-72/PR-122基板）

被写体：インメガチャート
測定器：波形モニター（15LINEモード）
測定点：ケーブルCCXC-9DBのVIDEO OUT

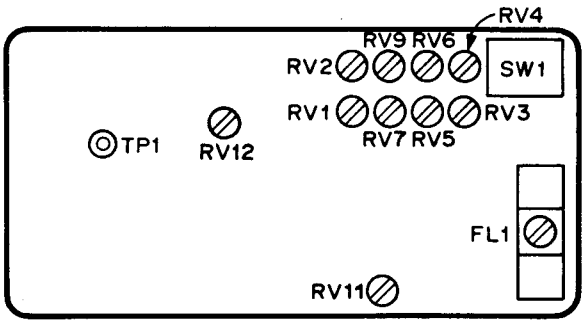
調整：

1. 調整箇所：レンズ絞り
   規格：0.5MHzの振幅A＝50±2IRE





RD-14 BOARD (A SIDE)



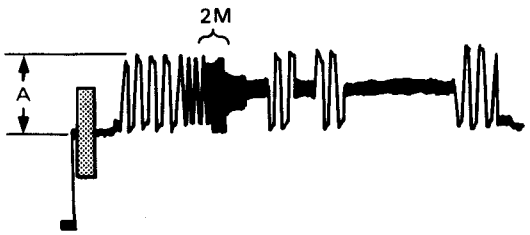
EN-72 BOARD (B SIDE)

2. 準備：◐RV4/EN-72基板を左一杯に回す。
調整箇所：◐RV3/EN-72基板
規格：2MHzの振幅A＝80±2IRE

3. 調整箇所：◐RV4/EN-72基板
規格：2MHzの振幅A＝50±2IRE

4. 調整箇所：◐RV3/EN-72基板
規格：2MHzの振幅A＝62±2IRE

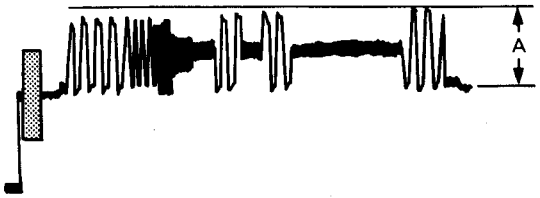
5. 調整箇所：◐RV16/PR-122基板
規格：2MHzの振幅A＝60±2IRE

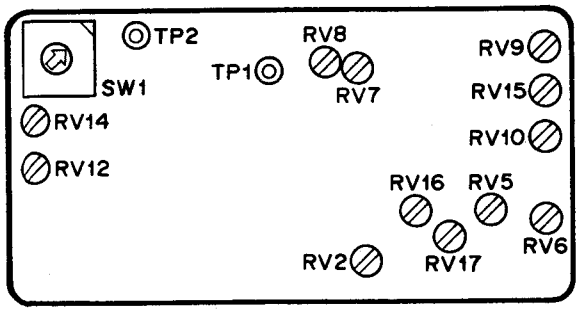


調整2～5

4-6-2. ホワイトクリップ調整（EN-72基板）

被写体：インメガチャート
レンズ絞り：開放
測定器：波形モニター
測定点：ケーブルCCXC-9DBのVIDEO OUT
調整箇所：◐RV5/EN-72基板
規格：A＝110±2IRE



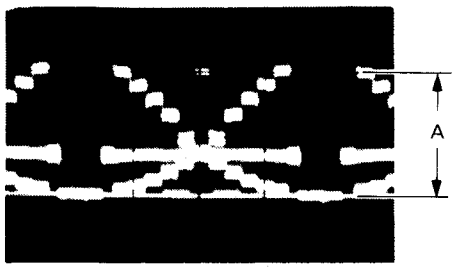


PR-122 BOARD (A SIDE)

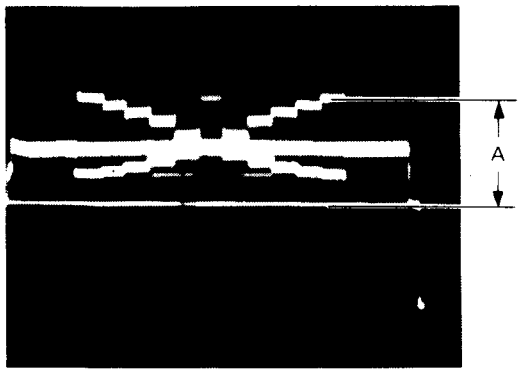
4-6-3. Cレベル調整（EN-72基板）

被写体：グレースケールチャート
調整：

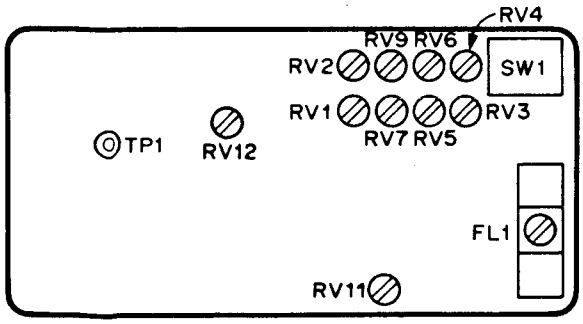
1. 測定器：波形モニター
   測定点：ケーブルCCXC-9DBのG OUT
   調整箇所：レンズ絞り
   規格：A＝100±2IRE



2. 準備：SW1/PR-122基板…「A」
   測定器：波形モニター
   測定点：ケーブルCCXC-9DBのG OUT
   調整箇所：◐RV9/EN-72基板
   規格：A＝100±5IRE



3. 確認：SW1-1/EN-72基板を「ON」,「OFF」にしても，Aのレベルは同じであること。

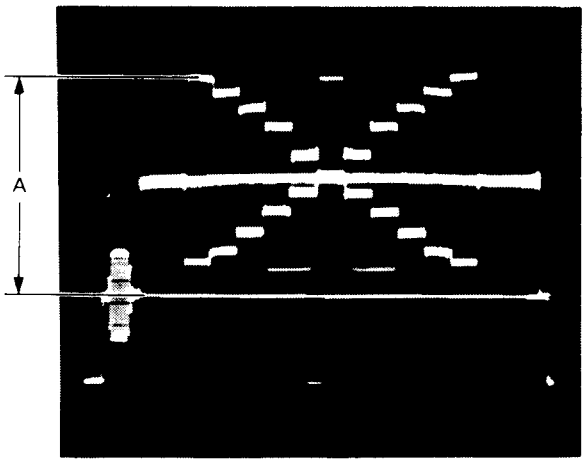


EN-72 BOARD (B SIDE)

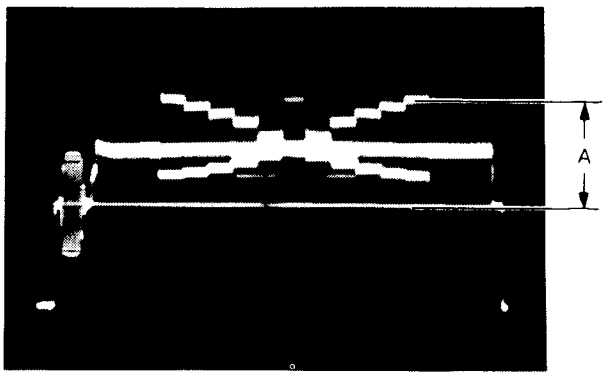
4-6-4. VBSレベル調整（EN-72基板）

被写体：グレースケールチャート
調整：

1. 準備：SW1-1/EN-72基板…「ON」
   測定器：波形モニター
   測定点：ケーブルCCXC-9DBのVIDEO OUT
   調整箇所：レンズ絞り
   規格：A＝100±2IRE



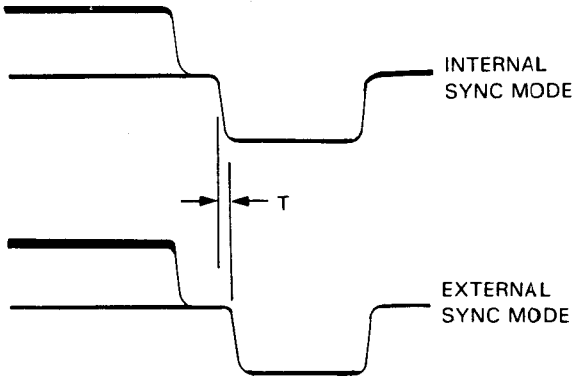
2. 準備：SW1-1/EN-72基板…「OFF」
   測定器：波形モニター
   測定点：ケーブルCCXC-9DBのVIDEO OUT
   調整箇所：◐RV2/EN-72基板
   規格：A＝100±5IRE



3. 確認：SW1-1/EN-72基板を「ON」にしても，Aのレベルは同じであること。

4-6-5. SYNC位相調整（EN-72基板）

被写体：グレースケールチャート
測定器：波形モニター
（波形モニタのSYNCをINT/EXTを切り換えながら測定する）
測定点：ケーブルCCXC-9DBのVIDEO OUT
調整箇所：◐RV12/EN-72基板（EXTの時）
規格：T≦100nS



4-7. ホワイトバランス系（MD-61基板）

準備：

1. DR-83基板，TG-48基板，PR-122基板，延長基板の順でMB-222基板から基板を取り外す。
2. PR-122基板をMB-222基板に取り付ける。
3. TG-48基板をMB-222基板に取り付ける。このとき，ハーネスが基板の下敷にならないように，ハーネスをフロント側に寄せてから取り付ける。
4. DR-83基板をMB-222基板に取り付ける。

※ 基板の取り外し，取り付けは，電源をOFFにしてから行って下さい。

4-7-1. 色温度調整（5600°K）

被写体：ホワイトウィンドウチャート

準備：レンズにLB140フィルターを被せる。

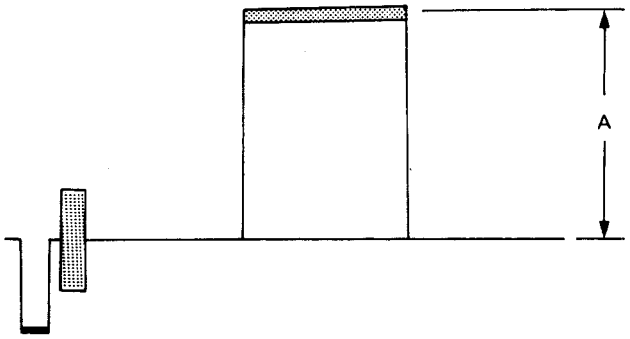
SW1-1/EN-72基板…「ON」

SW1-2/EN-72基板…「OFF」

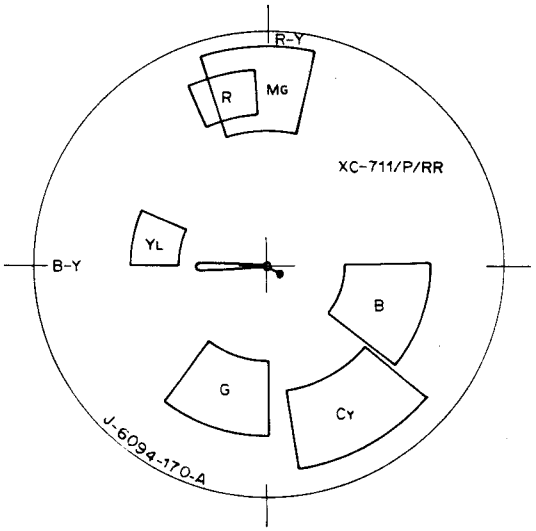
SW1-3/EN-72基板…「ON」

調整：

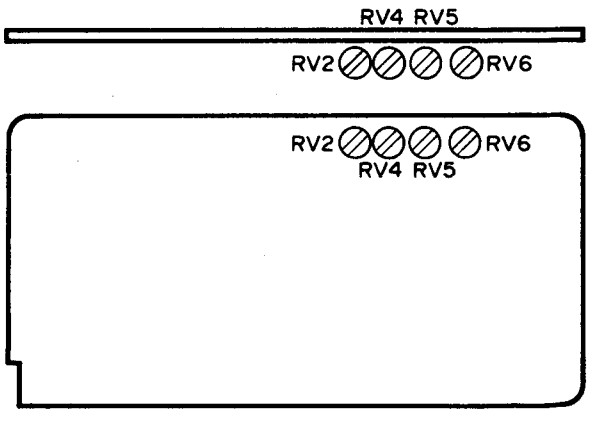
1. 測定器：波形モニター
   測定点：ケーブルCCXC-9DBのVIDEO OUT
   調整箇所：レンズ絞り
   規格：A＝90±3IRE



2. 測定器：ベクトルスコープ
   測定点：ケーブルCCXC-9DBのVIDEO OUT
   調整箇所：◐RV5，◐RV6/MD-61基板（交互に調整）
   規格：輝点がベクトルスコープ画面の中心にある。



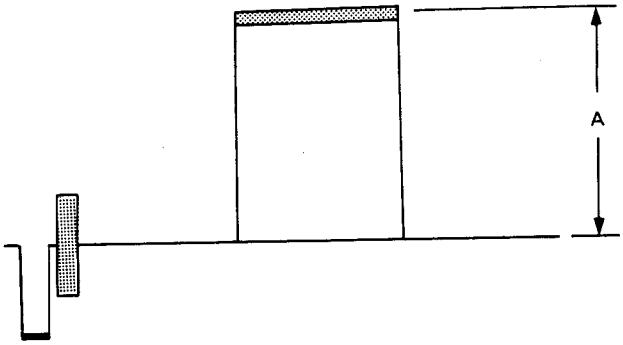
NOTE：調整後，レンズからLB140フィルターを外して下さい。



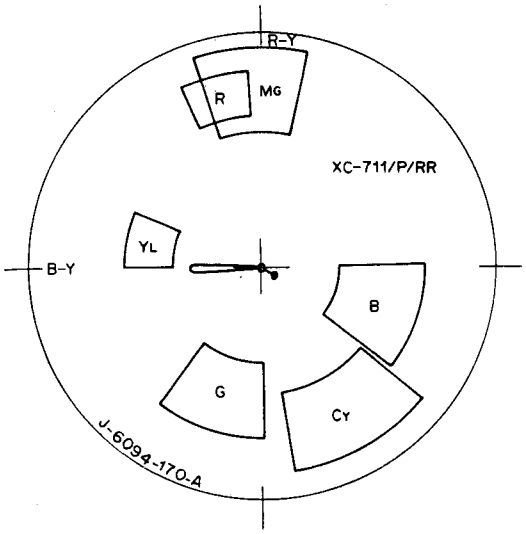
MD-61 BOARD (A SIDE)

4-7-2. オートホワイトバランスオフセット調整

被写体：ホワイトウィンドウチャート
準備：SW1-2/EN-72基板…「ON」
調整：
1. 測定器：波形モニター
   測定点：ケーブルCCXC-9DBのVIDEO OUT
   調整箇所：レンズ絞り
   規格：A＝50±2IRE



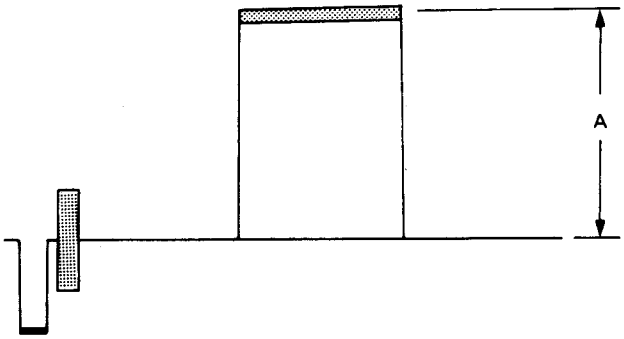
2. 測定器：ベクトルスコープ
   測定点：ケーブルCCXC-9DBのVIDEO OUT
   調整箇所：◐RV2，◐RV4/MD-61基板（交互に調整）
   規格：輝点がベクトルスコープ画面の中心にある。



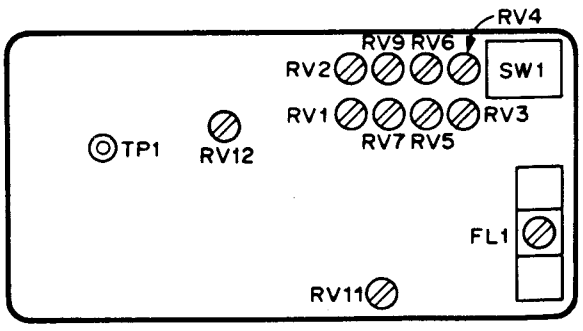
4-7-3. オートホワイトバランス動作確認

被写体：ホワイトウィンドウチャート
準備：
1. SW1-2/EN-72基板…「OFF」
2. レンズにLB200フィルターを被せる。

調整：測定器：波形モニター
   測定点：ケーブルCCXC-9DBのVIDEO OUT
   調整箇所：レンズ絞り
   規格：A＝50±2IRE



確認：測定器：ベクトルスコープ
   測定点：ケーブルCCXC-9DBのVIDEO OUT
   確認箇所：輝点の位置
規格：SW1-2/EN-72基板を「ON」にしたとき，輝点の位置がベクトルスコープ画面の中心へ移動する。

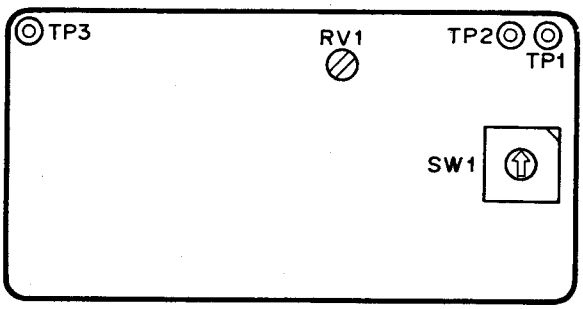


EN-72 BOARD (B SIDE)

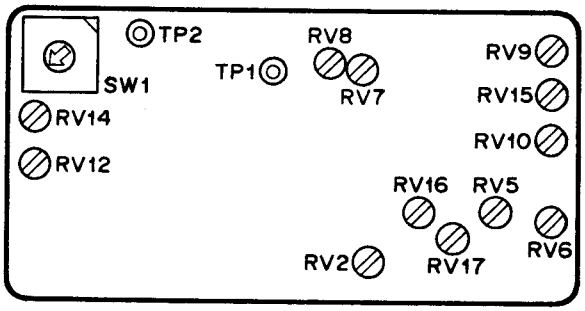
4-8. スイッチ設定

工場出荷時，各スイッチは次のように設定されています。

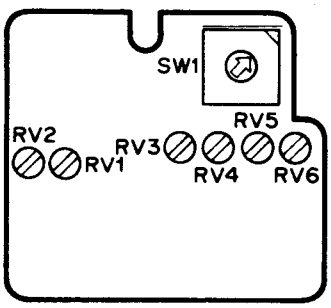
- DR-83基板　SW1…… 「0」
- PR-122基板　SW1 …… 「A」
- YC-38基板　SW1 …… 「2」
- EN-72基板　SW1-1…… 「ON」
  -2…… 「OFF」
  -3…… 「OFF」
  -4…… 「OFF」



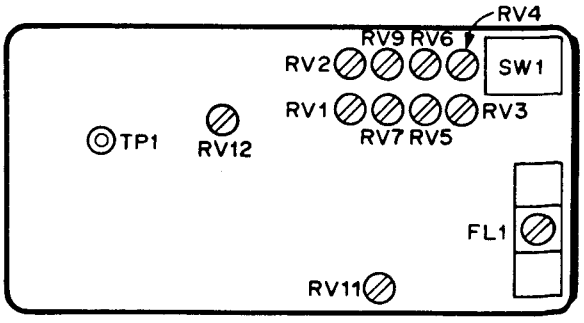
DR-83 BOARD (B SIDE)



PR-122 BOARD (A SIDE)



YC-38 BOARD (A SIDE)



EN-72 BOARD (B SIDE)

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SECTION 1
OPERATION

1-1. FEATURES

The XC-711 (NTSC model)/XC-711P (PAL model) is a color video camera module, which uses a CCD (Charge Coupled Device) for the pick up device. With application of a CCD, the camera produces an image with little geometric distortion and has high resistance to vibration and mechanical shocks. These features, together with compact size and light weight, make the XC-711/XC-711P suitable for application in a monitoring or surveillance system, or as an input device in an image processing system.

High resolution and natural color
The camera module can produce a high-quality, fine image having a large number of picture elements : 768 × 493 (XC-711)/756 × 581 (XC-711P).
The CCD has filters for the three primary colors (RGB), which allow the camera to achieve a high-fidelity color reproduction.

RGB output
In addition to a composite video signal output, the camera module has an RGB signal output, which can be used for connection with an RGB monitor or an image processing device such as a TARGA board.

Adaptability to diversified signal processing
Gain control can be internally set to the AGC (Automatic Gain Control) or Fixed, the γ (gamma) compensation can be set to ON or OFF, and the white balance can be adjusted automatically or manually. The integration mode of the electrical charge can be internally changed from the frame integration to the field integration. This enables the non-interlace mode sensitivity to be elevated to the level equivalent to the sensitivity of the interlace mode even when entering signals into the external sync input for the setting of the non-interlace mode.

Three types of external sync signals
Synchronization with other cameras is possible by entering the three types of signals from the external sync signal generator. The frequency lock range is set as wide as ±1% of the horizontal frequency.

HD and VD Signals: The unit automatically identifies by the HD (Horizontal Drive) or VD (Vertical Drive) signal whether it is the interlace or non-interlace type and applies the external synchronization in accordance with the identified synchronization type.

S/VS/VBS Signal: The unit is synchronized with the S (composite Sync) signal, VS (Video/composite Sync) signal, or VBS (Video/Burst/composite Sync) signal. (The synch system, whether by HD and VD signals or S/VS/VBS signal, is automatically selected accordingly.)

Internal sync signal output
Internally generated clock signal, HD and VD signals can be output to synchronize connected equipment with this camera module. (This function is activated by modifying the circuit connections inside the camera.)

Electronic shutter
The camera module has an electronic shutter. The shutter speed can be set to 1/60, 1/120, 1/250, 1/500, 1/1000, 1/2000, 1/4000, or 1/10000 seconds. In addition, the shutter can be set to the flickerless mode (1/100 or 1/120 seconds) to avoid the flickering image caused by the lighting with fluorescent lamps.

Usable with an auto iris lens
The lens mount is a standard C mount. Beside the VCL-16Y-M standard lens (manual iris), the VCL-08Y/VCL-16Y auto iris lens is usable for the camera module.

Solid body
The body consists of aluminum die cast and steel panel. On the bottom are 2 screw holes (reference holes) which can be used to keep deviation of the optical axis at a minimum.

Long life and high stability

Precise image geometry

Low lag and little image sticking

High resistance to vibration and mechanical shock

Quick start-up

Shooting in a strong magnetic field

Low power consumption (5.5 W)

**When the GAIN mode is set to AUTO or FIX-5dB for shooting an object with overall high brightness, flicker might occur in the picture.
In this case, reset the GAIN mode to FIX 0dB, FIX+6dB or FIX+12dB before continuing operation.**

1-2. COMPOSITION

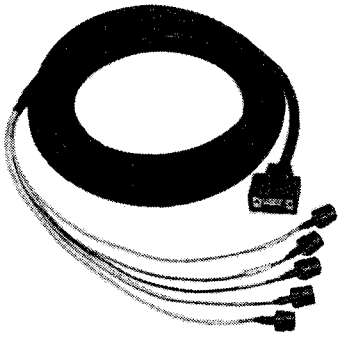
The CCD camera module system consists of the XC-711/711P and other optional products as shown below.

XC-711/711P
CCD camera module

PC-XC12 12-pin connector

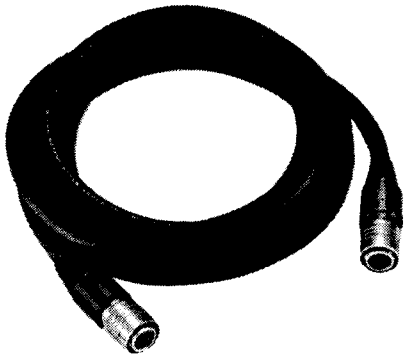
PC-XC04 4-pin connector

CCXC-9DB camera cable

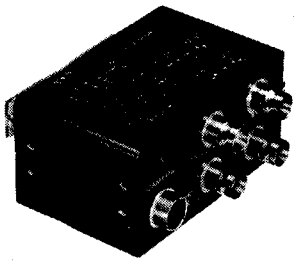


VCL-16Y-M standard lens

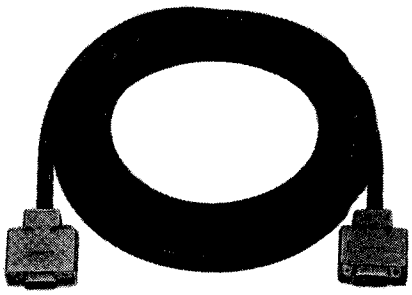
Camera cables
CCXC-12P02 (2m)
CCXC-12P05 (5m)
CCXC-12P10 (10m)
CCXC-12P25 (25m)



JB-77 junction box



CCXC-9DD camera cable



XC-711/711P CCD camera module

VCL-16Y-M standard lens
This is a standard lens of f = 16 mm, F1.4. The iris and focus are adjusted manually.

JB-77 junction box
This is attached to the camera module using the CCXC-12P02/12P05/12P10/12P25 camera cable and will supply power, transmit video signals, and exchange external sync signals.

PC-XC12 12-pin connector
This connector is prepared for system set up, and used to connect to the DC IN/VBS connector of the camera module.

PC-XC04 4-pin connector
This is used to attach the lens cord of the auto iris lens to the LENS connector on the camera module.

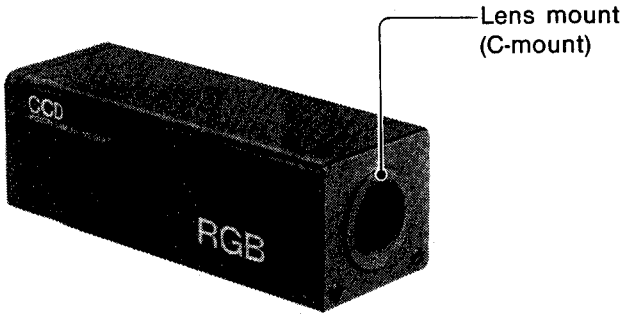
CCXC-12P02 (2m), 12P05 (5m), 12P10 (10m) and 12P25 (25m) camera cables
These cables can be attached to the 12-pin DC IN/VBS connector on the rear of the camera module to supply power, transmit video signals and exchange sync signals.

CCXC-9DD camera cable (DSUB-DSUB)
CCXC-9DB camera cable (DSUB-BNC)
Either of these cables can be attached to the 9-pin RGB/SYNC/YC connector on the rear of the camera module to transmit RGB, sync, and VBS (or Y/C) signals to an image processor, RGB monitor or other equipment which has RGB input connectors. For equipment having a DSUB 9-pin input connector, use the CCXC-9DD cable. For equipment having BNC type input connectors, use the CCXC-9DB cable.

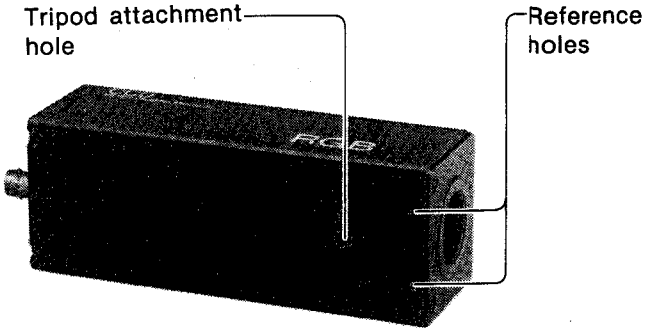
1.3. PARTS LOCATION, FUNCTION AND OPERATION

1-3-1. XC-711/711P CCD Camera Module

Front

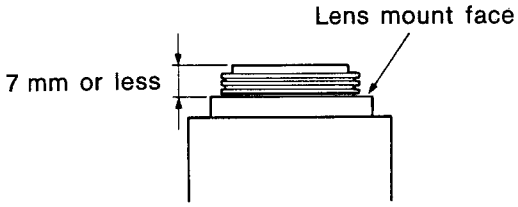


Bottom



Lens mount (C-mount)
Attach a C-mount lens, such as the VCL-16Y-M standard lens, or a piece of other optical equipment.

NOTE
Projection of the lens or other piece of optical equipment must be 7 mm or less from the lens mount face.

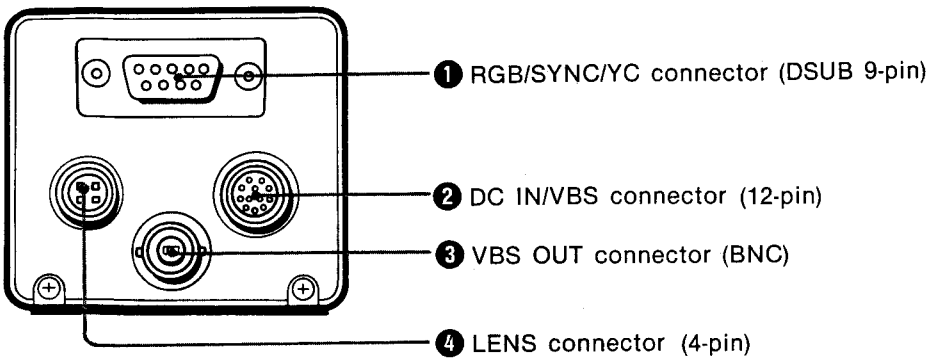


Reference holes
These are screw holes cut with high precision to affix the camera module. Affixing the module according to these reference holes keeps deviation of the optical axis at a minimum.
For details on dimensions, refer to the section 2 or later.

Tripod attachment hole
This hole (U1/4"-20 UNC) is used to attach the camera module to a tripod.

The screws to be used for attachment must be in accordance with the following specifications.
ISO standard: ℓ = 4.5 mm ±0.2 mm
ASA standard: ℓ = 0.197 inches

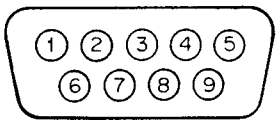
Rear



❶ RGB/SYNC/YC connector (DSUB 9-pin)

The RGB, sync, and VBS (or Y/C) signals are output from this connector. Connect to an RGB monitor or an image processor using a CCXC-9DD (DSUB-DSUB) or CCXC-9DB (DSUB-BNC) cable.

The pin assignment of this connector is shown in the chart below.



Pin No.	Sync mode	
	Internal	External
1	Ground	Ground
2	Ground	Ground
3	R output	R output
4*	G output	G output
5	B output	B output
6**	VBS output[1)]	Y output (NTSC)[1)] VBS output (PAL)[1)]
7***	Sync output	Sync output
8	Ground	Ground
9****	Ground	Ground

1): Signals output when γ compensation is on. When γ compensation is off, Y_L signal is output.

The pin settings can be changed as follows by modifying connections of the circuits inside the camera.

* The sync signal can be added to the G signal output from pin 4.

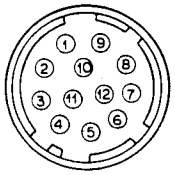
** The output from pin 6 can be set to the Y signal in all modes except when γ compensation is off. (When γ compensation is off, Y_L signal is output.)

*** The level of the sync signal output from pin 7 can be changed from 0.3 Vp-p (factory setting) to 2.0 Vp-p.

**** The output from pin 9 can be set to the chroma signal in the γ:on and internal sync mode. (For the XC-711P, this is effective in the external sync mode, too.)

❷ DC IN/VBS (DC power input/VBS) connector (12-pin)
Connect a CCXC-12P02, CCXC-12P05, CCXC-12P10 or CCXC-12P25 camera cable to this connector to supply power (12 V DC) from an external power source and output the video signal from the video camera module. When a sync signal generator is connected to supply the HD and VD signals or S/VS/VBS signal, the camera module can be operated on external sync mode.

The pin assignment of this connector is shown in the chart below.



Pin No.	External Sync mode			Internal Sync mode
	HD, VD	S/VS/VBS	RESTART RESET	Camera Sync output
1	Ground	Ground	Ground	Ground
2	+12 V	+12 V	+12 V	+12 V
3	Video output* (ground)	Video output* (ground)	Video output* (ground)	Video output* (ground)
4	Video output* (signal)	Video output* (signal)	Video output* (signal)	Video output* (signal)
5	HD input (ground)	—	HD input (ground)	HD output (ground)
6	HD input (signal)	—	HD input (signal)	HD output (signal)
7	VD input (signal)	S/VS/VBS input (signal)	RESET PULSE (signal)	VD output (signal)
8	—	—	—	CLOCK output (ground)
9	—	—	—	CLOCK output (signal)
10	Ground	Ground	—	Ground
11	+12 V	+12 V	—	+12 V
12	VD input (ground)	S/VS/VBS input (ground)	RESET PULSE (ground)	VD output (ground)

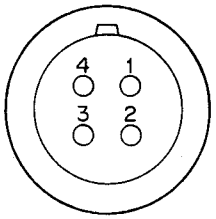
*: When γ compensation is ON—VBS output.
When γ compensation is OFF—Y_L output.

❸ VBS OUT (output) connector (BNC connector)
The video signal from the video camera module is output from this connector. This connector can be used only when a CCXC-12P02 camera cable is connected to the DC IN/VBS connector and the video output of the 12-pin connector of the CCXC-12P02 cable is not terminated with 75 ohms.

The output signal from this connector is shown in the chart below.

γ: ON		γ: OFF
Internal sync	External sync	Y_L output
VBS output	Y output (NTSC) VBS output (PAL)	

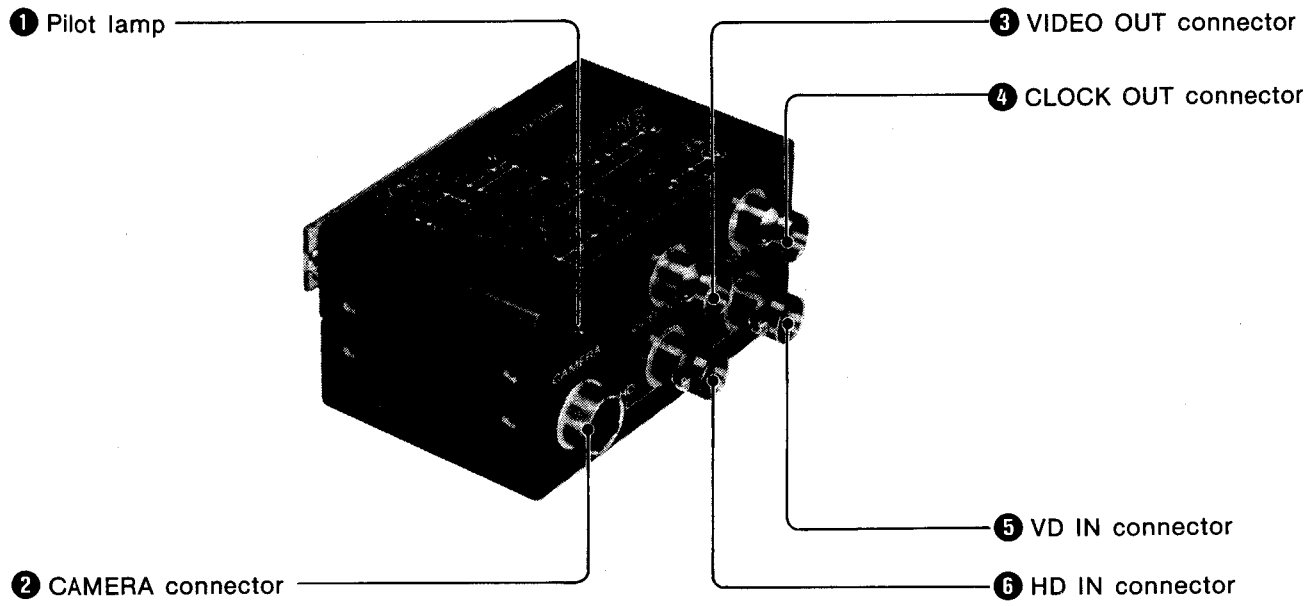
❹ LENS connector (4-pin)
When the plug of an auto iris lens is connected to this connector, the iris of the lens can automatically be adjusted.
The pin assignment of this connector is shown in the chart below.



Pin No.	Signal
1	+12 V
2	Ground
3	—
4	Video signal

1-3-2. JB-77 Junction Box

Front



❶ Pilot Lamp
Lights up when 12 V DC is input.

❷ CAMERA connector (12-pin)
Connect a CCXC-12P02/12P05/12P10 or CCXC-12P25 camera cable to this connector to supply power (12 V DC) from an external power source and external sync signals from an external sync system and to input the video signal from the video camera module.

❸ VIDEO OUT (output) connector (BNC connector)
The video signal from the video camera module is output from this connector when connected to a video monitor or VTR.

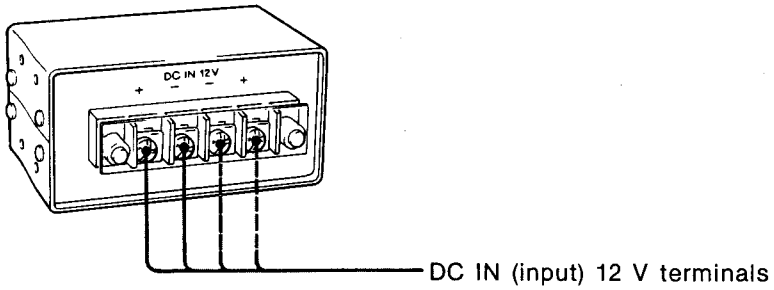
❹ CLOCK OUT (internal sync signal output) connector
Clock signal is output through this connector for the independent use of the camera module.

❺ VD IN connector (BNC connector)
Connect the sync signal generator to input the VD signal or the S/VS/VBS signal. This enables the camera module to be operated on external sync signals.
- When receiving VD signals, input HD signals to the HD IN connector.
- When receiving S/VS/VBS signals, do not input HD signals to the HD IN connector.

For the independent use of the camera module, the VD signal can be output by changing the camera module's internal wiring.

❻ HD IN connector
Connect the sync signal generator to input the HD signal. Combining it with the VD signal input from VD IN connector enables the camera module to be operated on external sync signals.
For the independent use of the camera module, the HD signal can be output by changing the camera module's internal wiring.

Rear

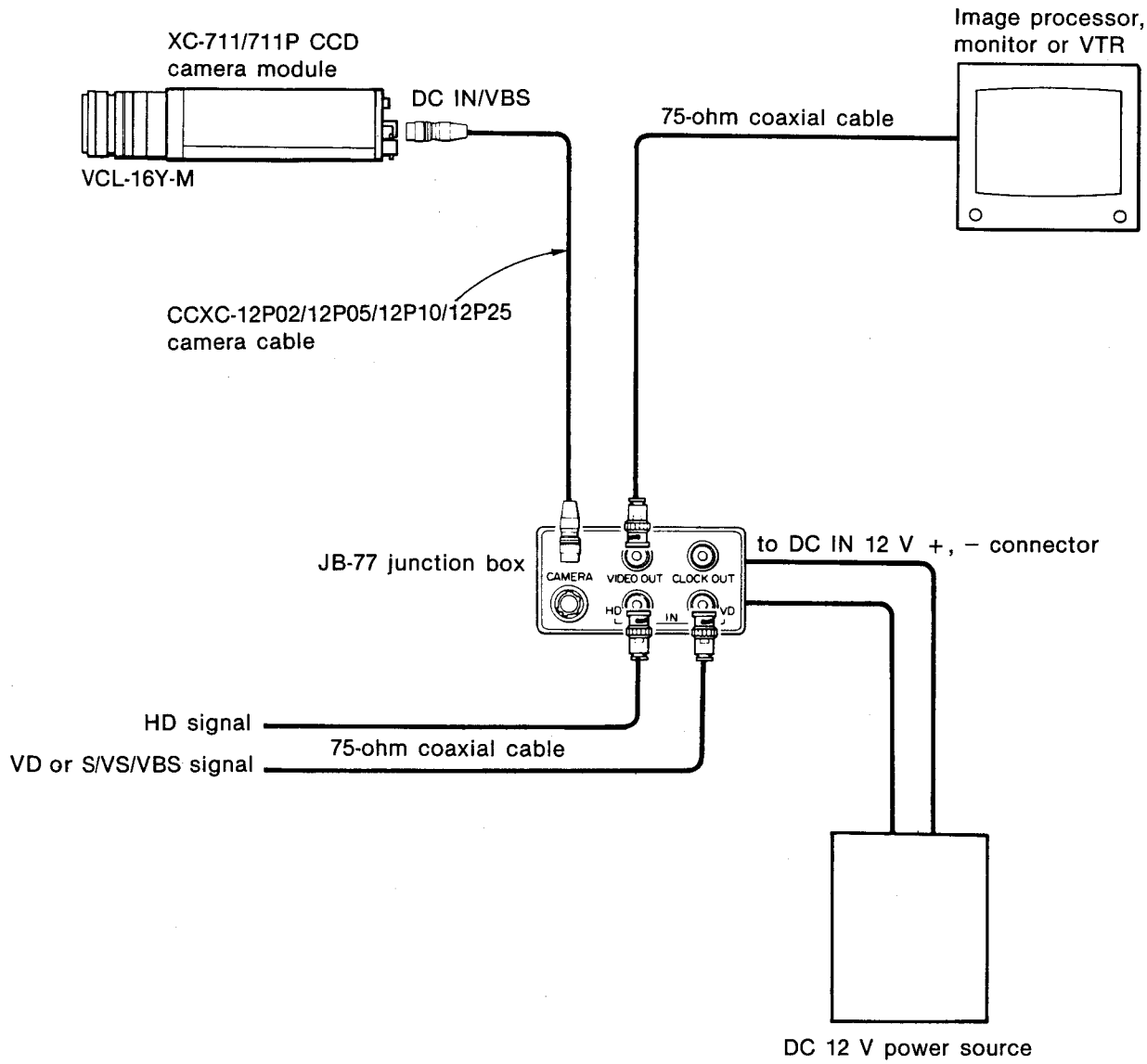


DC IN (input) 12 V terminals
DC 12 V power is received through one pair of these terminals. When connecting a multiple number of camera modules, connect other JB-77 to the other pair of terminals. Power can be supplied to the connected JB-77.

1-4. CONNECTIONS

1-4-1. To Use Video Signal Output

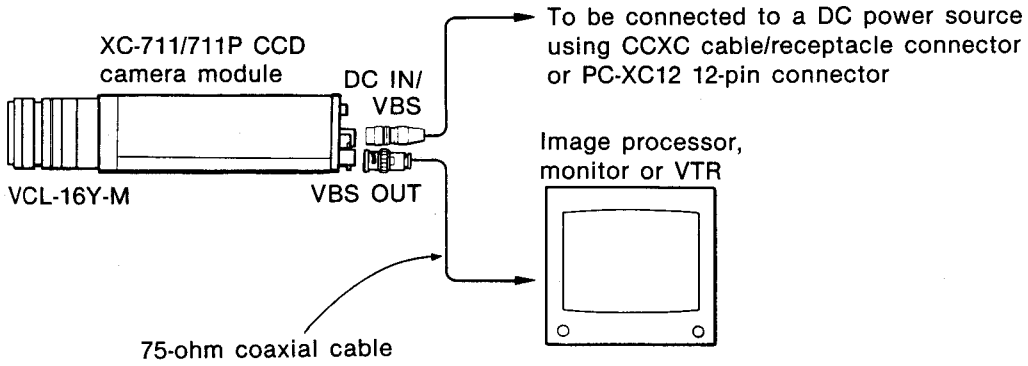
When Junction Box is used



NOTE

When applying external sync through the VS or VBS signal, the image may be affected by the VS or VBS signal during gen lock if a long type CCXC cable (CCXC-12P25) is used. When this occurs, use only S (composite Sync) signal.

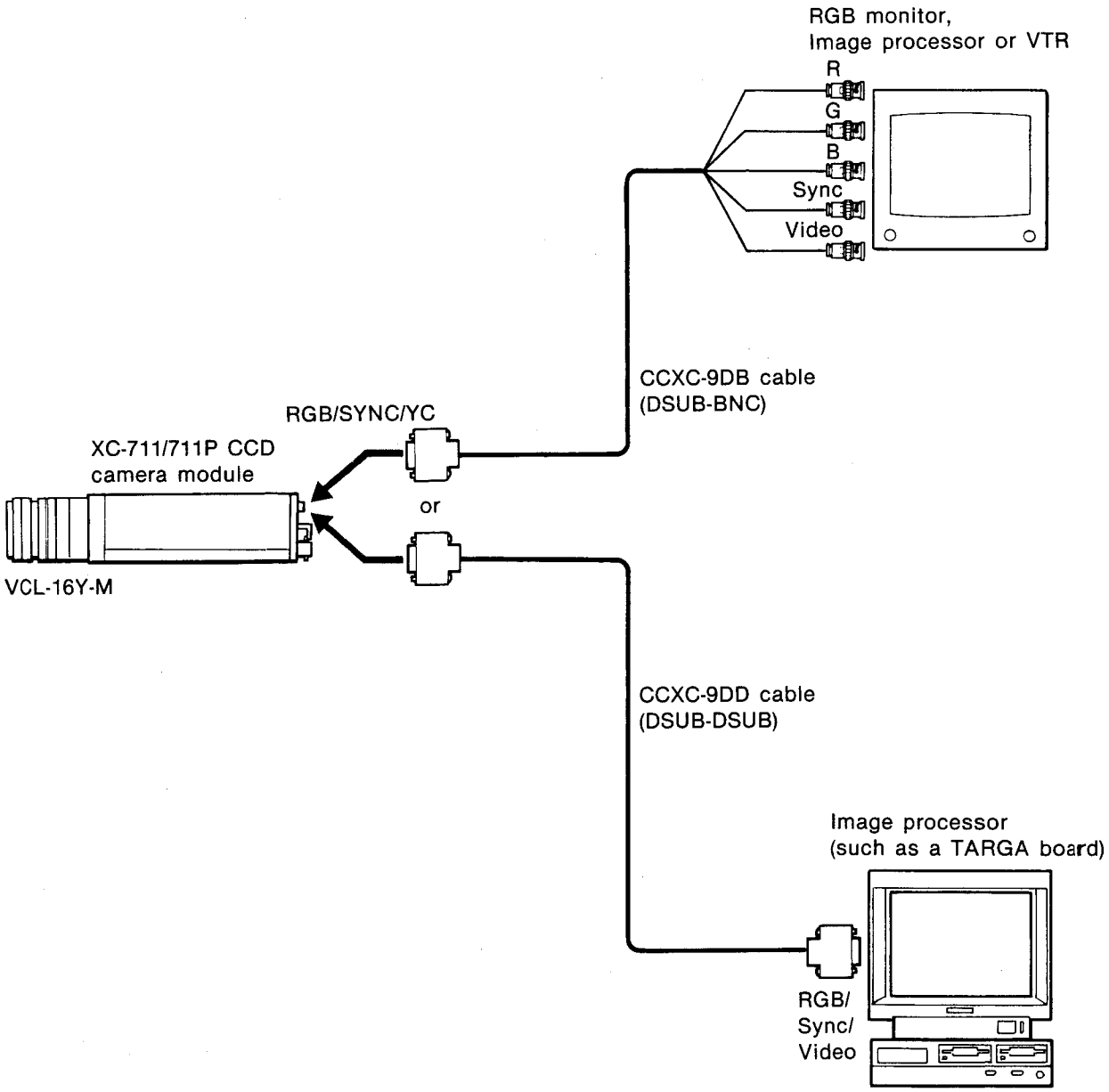
When Junction Box is not used



NOTES

- When using the VBS OUT connector for video signal output, use the DC IN/VBS connector for power supply. Connect only the CCXC-12P02 cable to the DC IN/VBS connector, and do not terminate its video output.
- When a cable longer than 5 m is connected to the DC IN/VBS connector, video output signals cannot be obtained through the VBS OUT connector.

1-4-2. To Use RGB Signal Output



NOTE

Supply with power souce from DC IN/VBS terminal.

1-5. INITIALIZATION OF MODE

Modes for the following 13 items can be switched. At the factory, each item is set to the mode shown upper in the list below.
For details on the mode, refer to the chapter 2.

Item	Mode	Remarks
GAIN	FIX (0 dB)	Selection from −6,0, +6, +12 dB
	AUTO	Automatic control
γ	ON	Make γ compensation
	OFF	No γ compensation
FIELD	NORMAL	Normal scanning
	INVERSE	Even and odd number fields are inversed
INTEGRATION	FRAME	Frame integration mode
	FIELD	Field integration mode
RESTART RESET	NORMAL	Frame not synchronizing
	RESET	Frame synchronizing
WHITE BALANCE	AUTO	Automatic adjustment
	PRESET	Fixed (3200°K) or variable preset (2600° to 9000°K)
Y/C	COMPOSITE	VBS (or Y) output
	SEPARATE	Y (and C) output
G ON SYNC	NO	Normal G signal
	YES	Sync signal mixed into G signal
HUE PRESET	NO	Make hue compensation
	YES	No hue compensation
ELECTRONIC SHUTTER	OFF	No flikerless
	ON	Speed selected from *1/60, 1/125, 1/250, 1/500, 1/1000, 1/2000, 1/4000 and 1/10000 sec.
FLICKERLESS	OFF	
	ON	Speed selected from 1/100 and 1/120 sec.
SYNC LEVEL	0.3 Vp-p	
	2.0 Vp-p	
SYNC	EXTERNAL	Input external synchronization signals
	INTERNAL	Output internal synchronization signals

*: Shutter speed of 1/60 sec. is not possible in XC-711.

1-6. PRECAUTIONS

Power source
Operates on 12 V DC. Use a regulated power source, free from ripples or noise.

Foreign objects
Do not spill any liquid, drop any inflammable or metal objects inside. This could result in a fire, electrification, malfunction or accident.

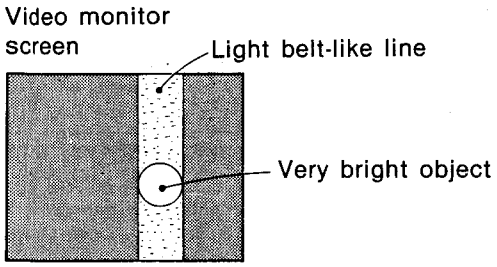
Do not wrap in cloth while operating the unit.

Locations for operation and storage
Avoid operating or storing in the following places.
- An extremely hot or cold location.
  Operating temperature: 0°C to 40°C (32°F to 104°F)
- A location exposed to high humidity or dust.
- A location exposed to rain.
- A location subjected to strong vibrations.
- A location near a TV or radio station which radiates high powered radio signal.

Care
Clean the dust on the surface of the lens and optical filter with a blower. Clean the exterior with a soft, dry cloth. If it becomes very dirty, clean with a cloth slightly moistened with a mild detergent solution. Do not use any type of solvent, such as alcohol or benzine, which may damage the finish.

1-7. PHENOMENON PECULIAR TO CCD

Smear phenomenon
This phenomenon occurs when shooting a very bright object (such as electric light, fluorescent lamp, the sun or a strong reflection).



Smear phenomenon
This phenomenon occurs when shooting a very bright object (such as electric light, fluorescent lamp, the sun or a strong reflection).

False signal
When vertical stripes or straight lines are shot, they may look wavy.

Blemishes
The CCD consists of many photosensor elements aligned horizontally and vertically. If the CCD has a defective element (even when it is with the specifications) will appear as a blemish on the monitor screen.

White micro dots
At high temperatures, numerous white dots may appear on the screen when shooting a dark object.

SECTION 2
COMPREHENSIVE SPECIFICATIONS

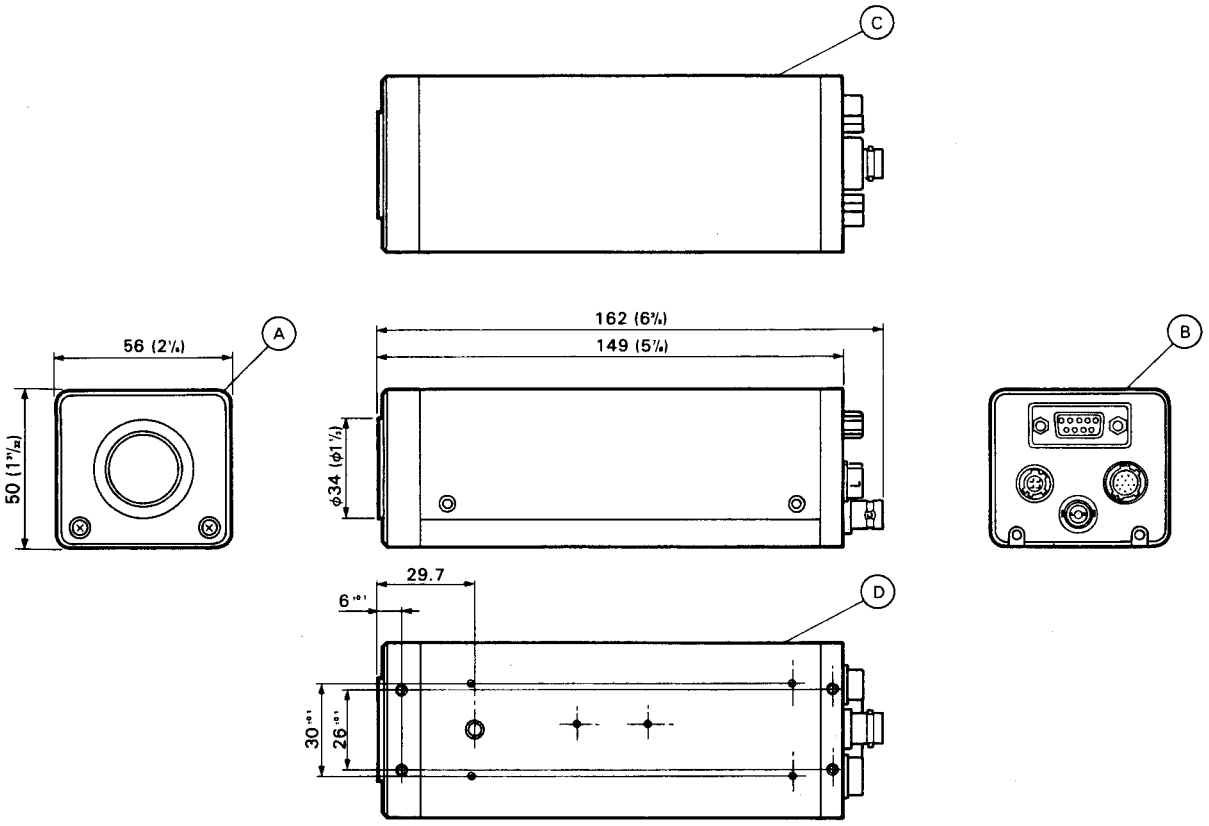
2-1. SPECIFICATIONS

<CAMERA MODULE XC-711>	
Pickup Device	Interline transfer CCD
Picture elements	768 (H) x 493 (V)
Sensing area	8.8 mm x 6.6 mm (the same as the 2/3-inch camera tube)
Optical black	50 pixels each horizontal line
Vertical drive frequency	15.734 kHz
Horizontal drive frequency	14.318 MHz
Signal system	EIA standard
Cell size	17 μm (H) x 11 μm (V)
Chip size	10.0 mm (H) x 8.2 mm (V)
Optical System	
Lens mount	C mount
Frange back length	17.526 mm
Sync System	Internal/External automatic change
External sync input	S/VBS/VS (sync level: 0.3 Vp-p ± 6 dB) HD and VD (HD, VD level: 2 to 5 Vp-p)
External sync frequency tolerance	± 1%
Jitter	Within ± 100 n sec
Locking time when power is on.	Within 10 sec
Scanning System	2 : 1 Interface; 525 lines
Video Output	VBS (1.0 Vp-p sync negative, 75 ohms unbalanced.) RGB (0.7 Vp-p)
Horizontal Resolution	330 TV lines
Vertical Effective lines	2 : 1 Interlace; 485 lines
Sensitivity	2000 Luxes with F4 (γ ON/0 dB)
Minimum Illumination	25 Luxes, F1.4, + 12 dB
S/N ratio	50 dB
Power Requirement (Tolerance)	DC 12 V (10.5 V to 15 V)
Power Consumption	5.5 W
Weight	
Camera module	380 g (XC-711)
Junction box	170 g (JB-77)
Storage Temperature	−20°C to +50°C
Operating Temperature	0°C to 40°C
Shock resistance	70 G
Storage Humidity	Within 90%
Operating Humidity	Within 70%

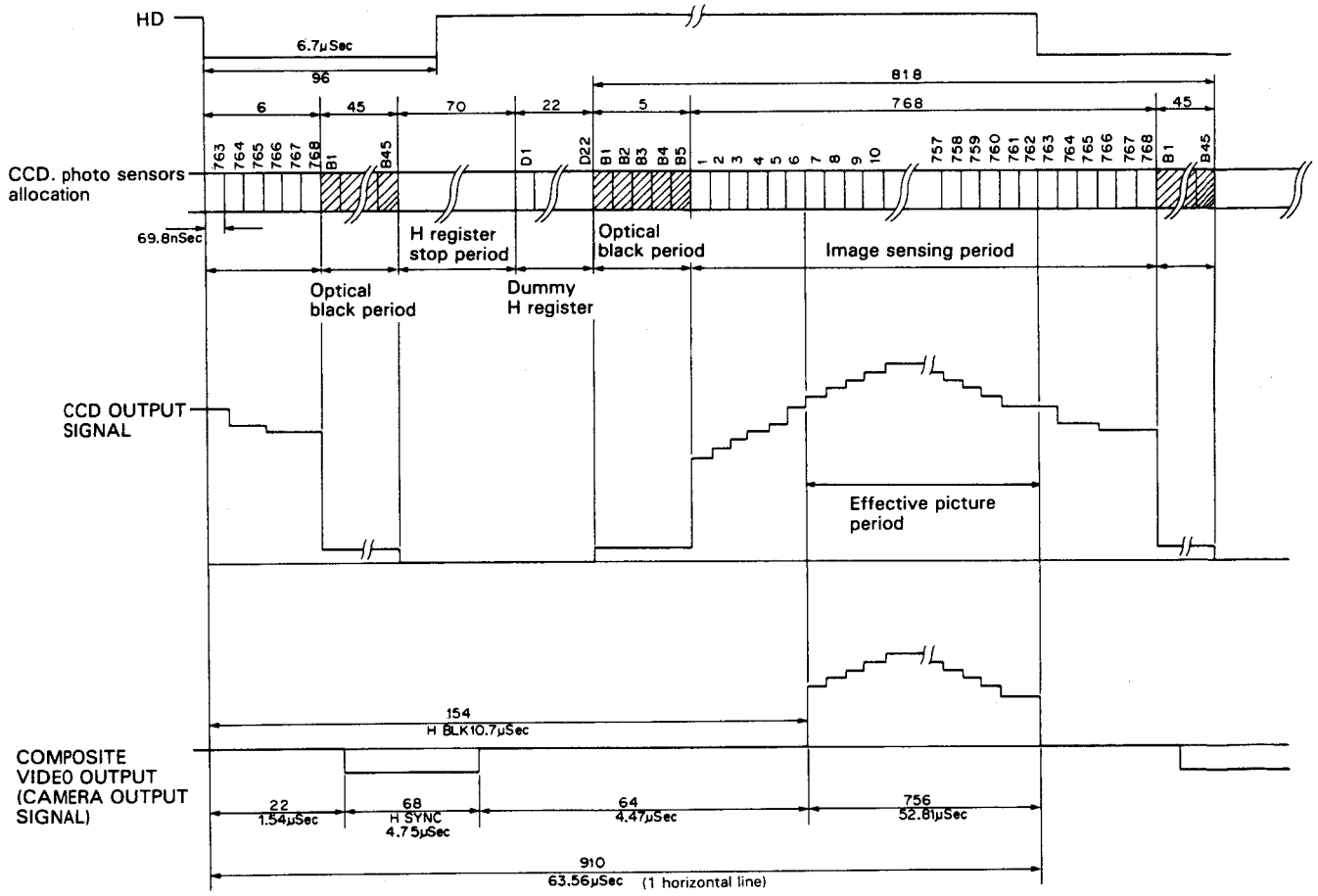
<STANDARD LENS VCL-16Y-M>	
Focal Length	16 mm
Maximum Aperture Ratio	1 : 1.4
Iris Control	F1.4 to F16
Filter Thread	M 25.5 mm x P 0.5 mm
Mount	C mount
Weight	50 g

Dimensions:

Camera Module <XC-711>



2-2. OUTPUT SIGNAL TIMING CHART



2-3. EXTERNAL SYNCHRONIZATION

There are three external synchronization modes:
1. S/VS/VBS mode
2. HD and VD mode
3. RESTART RESET mode

2-3-1. S/VS/VBS Mode

The S/VS/VBS mode provides external synchronization by supplying a normal composite signal, S, VS or VBS, to pin 7 of the 12-pin connector.

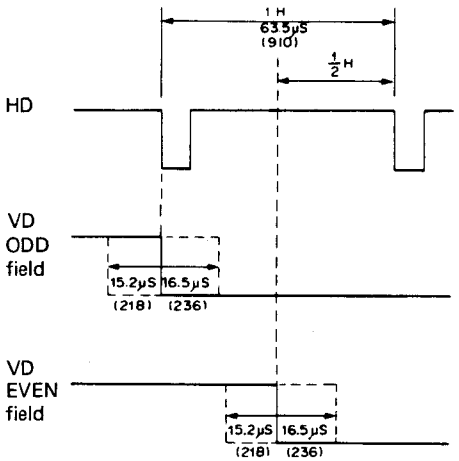
2-3-2. HD and VD Mode

The HD and VD mode provides external synchronization by supplying an HD signal to pin 6 and a VD signal to pin 7 of the 12-pin connector.

• Input conditions of HD and VD signals

• Frequency (period)
HD: 15.734 KHz ± 1% (63.56 μs ± 1%)
VD: 244 to 1023 1/2 H
*The maximum number of vertical effective lines is 493 in the interlace mode.
In the non-interlace mode, it is 246 for both the ODD field and the EVEN field.

• Phase



The figure in parentheses ( ) indicates the number of clock pulses

As shown in the illustration above, the ODD field is provided when the phase shift between the trailing edge of the VD signal and the trailing edge of the HD signal is between a lead of 15.2 μs and a lag of 16.5 μs. The EVEN field is provided when the phase shift between the trailing edge of the VD signal and the point 1/2H from the trailing edge of the HD signal is between a lead of 15.2 μs and a lag of 16.5 μs.

• Interlace and non-interlace

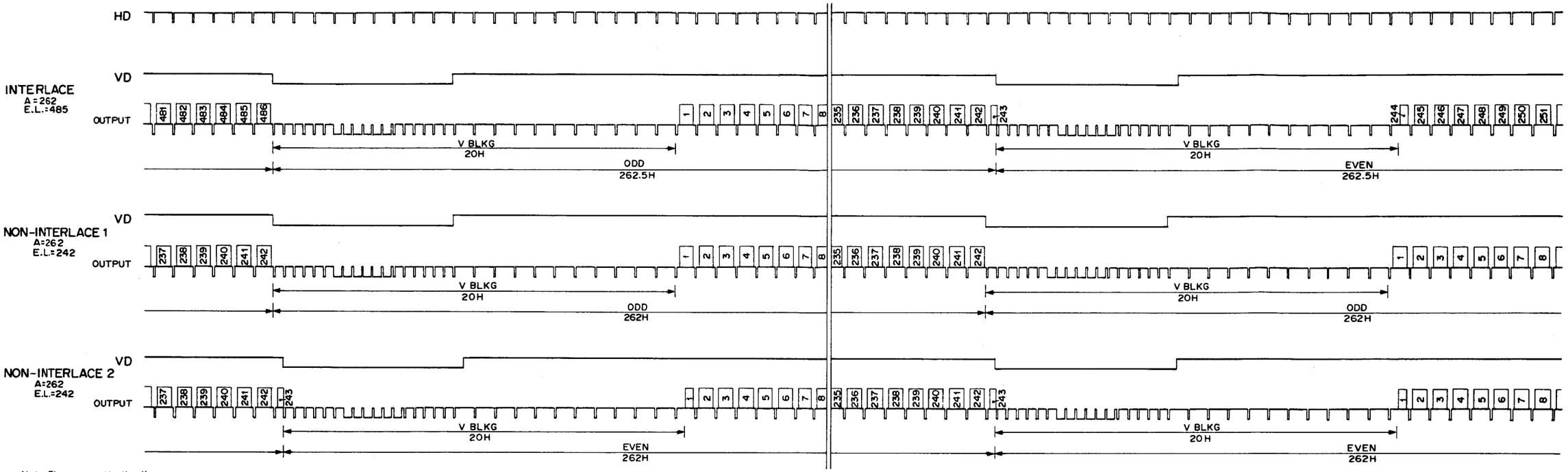
Operation can be performed in either interlace or non-interlace mode by changing the input condition of the VD signal. See Figure 1.

• Interlace

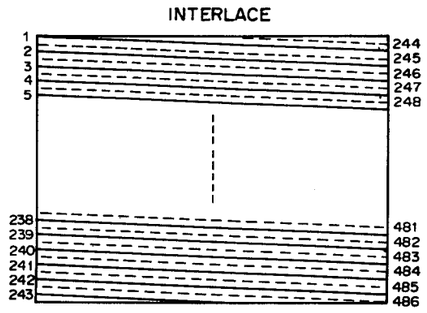
To operate in the interlace mode, set the period of the VD signal to (A + 1/2) H.A is an integer, 244 to 1023. In other words, the phase of the leading edge of the VD signal against the leading edge of the HD signal is changed for each VD signal. The field changes from ODD to EVEN and to ODD, repeatedly during operation in the interlace mode. At this time, the number of scanning lines per frams is 2A + 1.

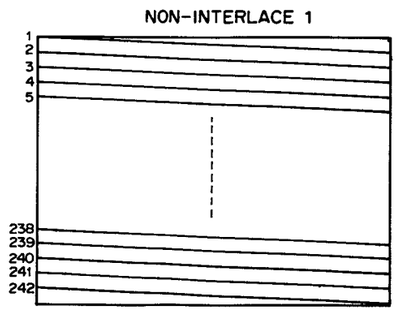
• Non-interlace

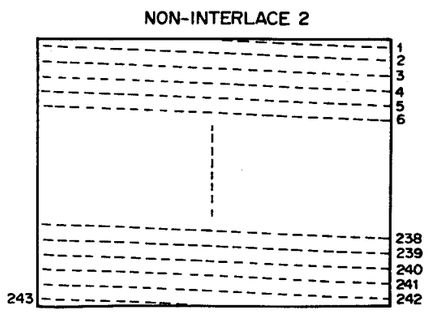
To operate in the non-interlace mode, set the period of the VD signal to A H. A is an integer, 244 to 1023. In other words, the phase of the leading edge of the VD signal against the leading edge of the HD signal is not changed for each VD signal, and the field ODD or EVEN remains unchanged for operation in the non-interlace mode. The number of scanning lines is A; this is half of the number of scanning lines for operation in the interlace mode. The sensitivity is half of the sensitivity provided in the interlace mode, when the frame is stored. See Figure 2.



Note:EL means ettective line







[Fig. 1]

Read out mode

Scanning mod

Scanning

NORMAL M

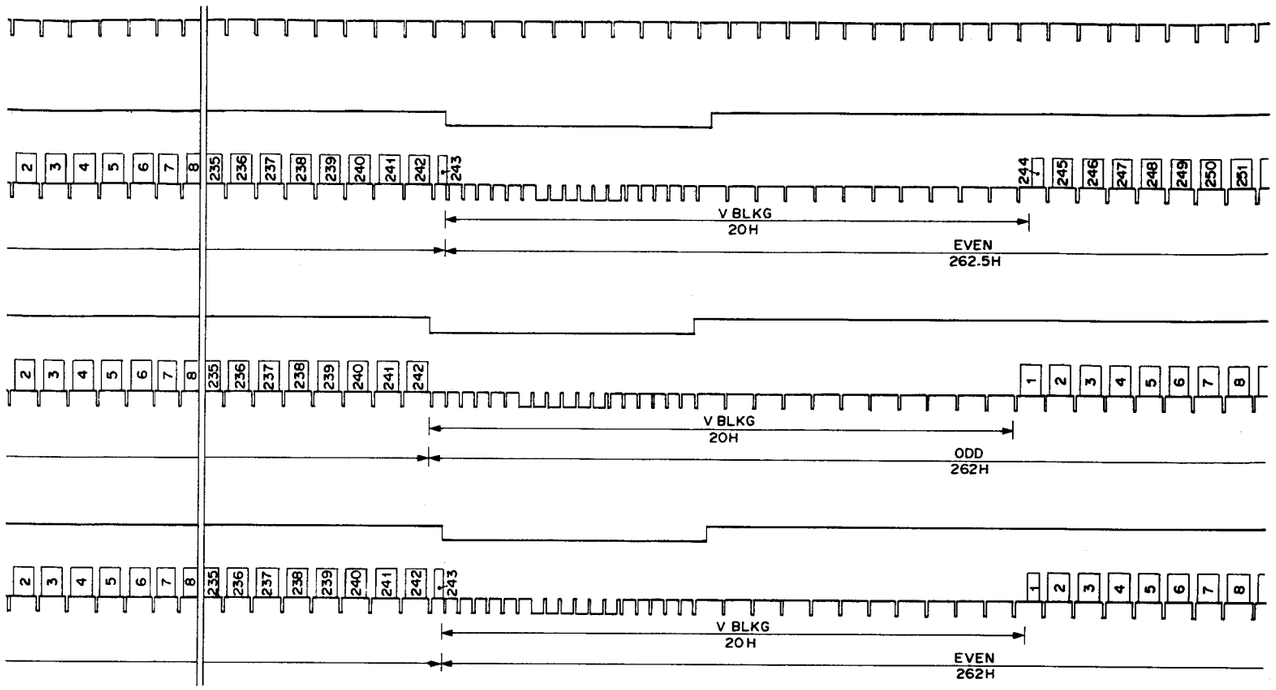
INVERSE M

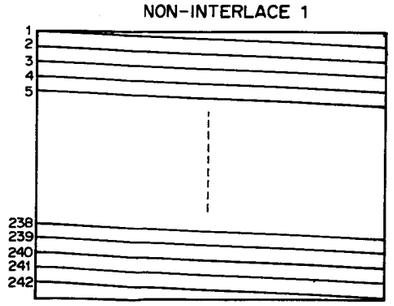
Storage time a
VIDEO OUT cc

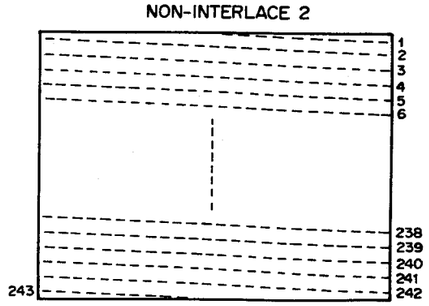
Vertical effect
(TV lines)

RESTART F

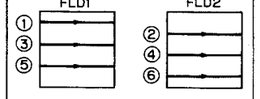
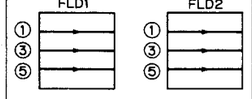
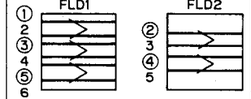
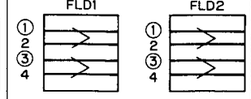
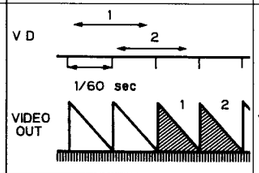
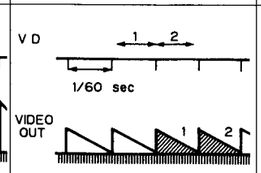
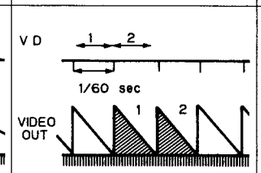
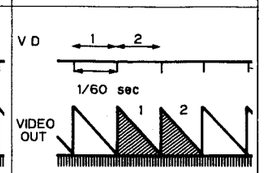
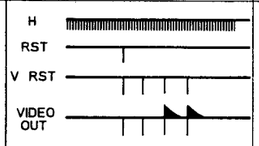
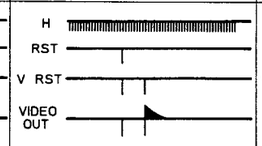
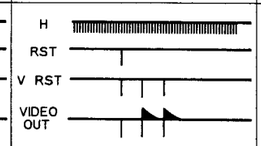
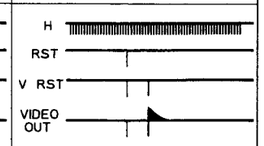
Features and application



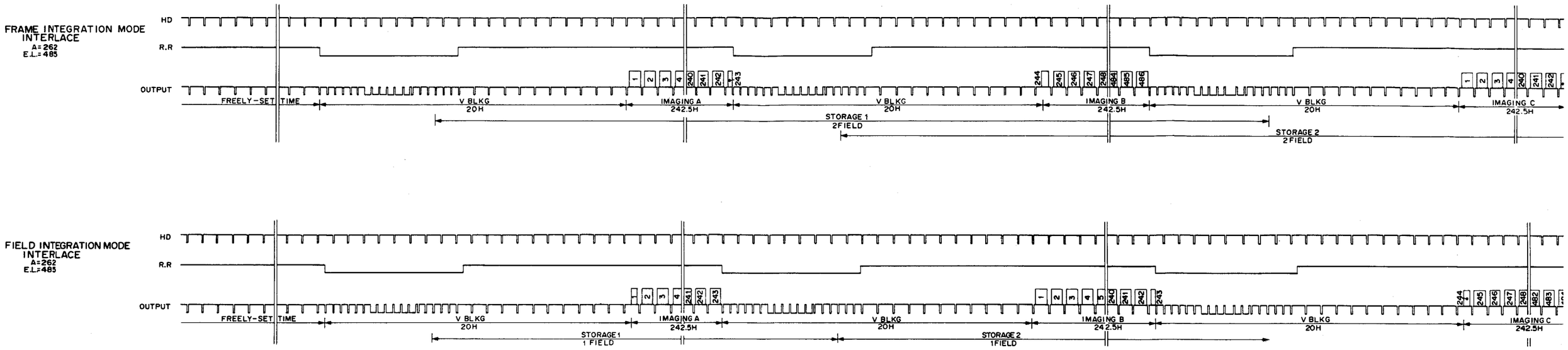




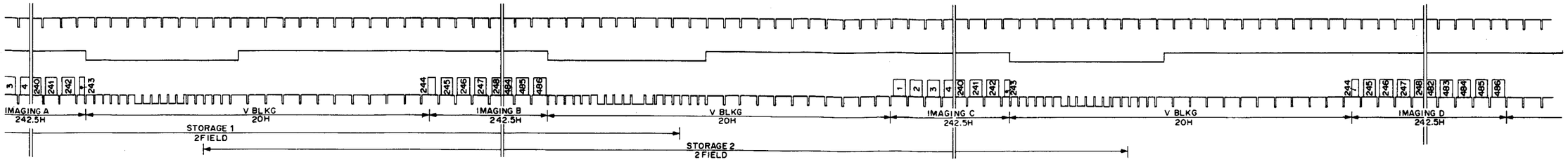
[Fig. 1]

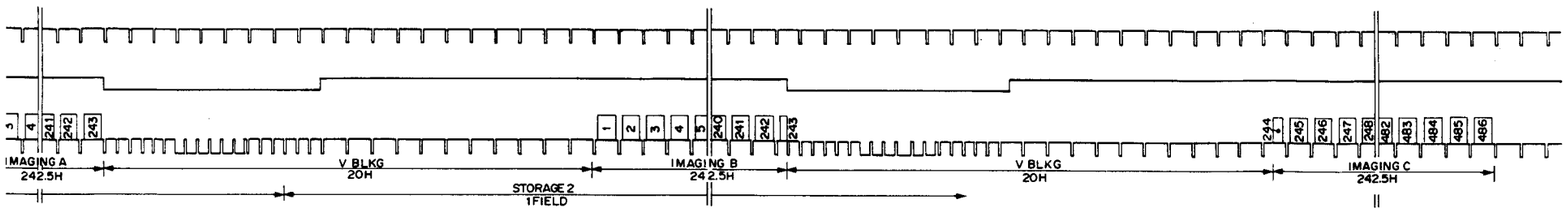
Read out mode setting		Frame integration mode (XC-711 initial setting)		Field integration mode	
Scanning mode		Interlace	Non-interlace	Interlace	Non-interlace
Scanning	NORMAL MODE				
	INVERSE MODE	FLD 1 and FLD 2 are inverted.	FLD 1 and FLD 2 become ②, ④, ⑥....	FLD 1 and FLD 2 are inverted.	FLD 1 and FLD 2 become ②, ④, ⑥....
Storage time and VIDEO OUT correlation					
Vertical effective lines (TV lines)		485	242	350	242
RESTART RESET					
Features and application		As the highest possible resolution is obtained, it is adapted to the measurements of the frame memory.	Same system as XC-39. Operates per 1 vertical line. Note: The operation is field integration mode.	Due to the storage of 1/60 seconds, a picture with even less disturbances than the frame integration mode is obtained. Adapted to pick up a moving object.	This system obtains all the vertical information without decreasing the sensitivity in non-interlace mode.

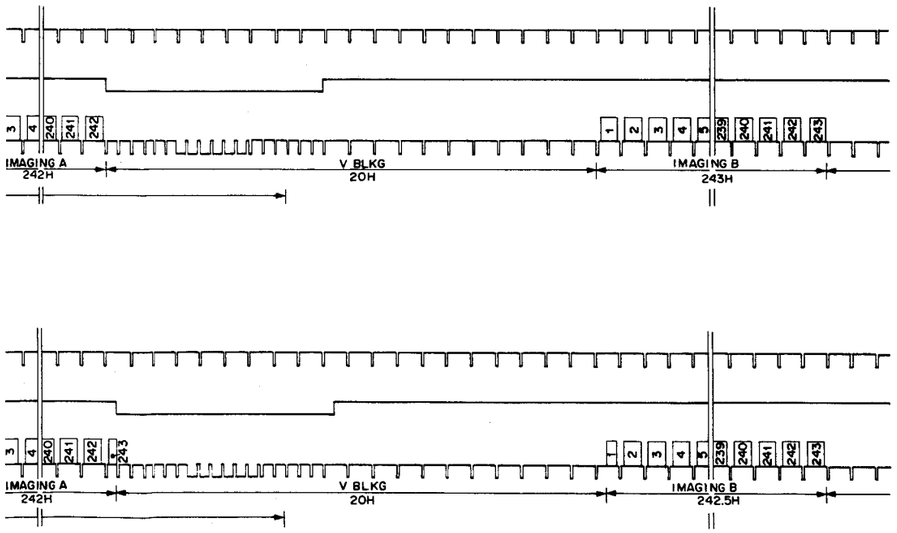
[Fig. 2] Relation between scanning mode and integration mode


FRAME INTEGRATION MODE
INTERLACE
A=262
E.L.=485
HD
R.R
OUTPUT
FREELY-SET TIME
V BLKG
20H
IMAGING A
242.5H
V BLKG
20H
IMAGING B
242.5H
V BLKG
20H
IMAGING C
242.5H
STORAGE 1
2FIELD
STORAGE 2
2FIELD
FIELD INTEGRATION MODE
INTERLACE
A=262
E.L.=485
HD
R.R
OUTPUT
FREELY-SET TIME
V BLKG
20H
IMAGING A
242.5H
V BLKG
20H
IMAGING B
242.5H
V BLKG
20H
IMAGING C
242.5H
STORAGE 1
1 FIELD
STORAGE 2
1FIELD
NON-INTERLACE 1
A=262
E.L.=243
HD
R.R
OUT PUT
FREELY-SET TIME
V BLKG
20H
IMAGING A
242H
V BLKG
20H
IMAGING B
243H
STORAGE 1
1FIELD
NON-INTERLACE2
A=262
E.L.=242
HD
R.R
OUTPUT
FREELY-SET TIME
V BLKG
20H
IMAGING A
242H
V BLKG
20H
IMAGING B
242.5H
STORAGE1
1FIELD

[Fig. 3]


IMAGING A
242.5H
V BLKG
20H
IMAGING B
242.5H
V BLKG
20H
IMAGING C
242.5H
V BLKG
20H
IMAGING D
242.5H
STORAGE 1
2FIELD
STORAGE 2
2FIELD


IMAGING A
242.5H
V BLKG
20H
IMAGING B
242.5H
V BLKG
20H
IMAGING C
242.5H
STORAGE 2
1FIELD


IMAGING A
242H
V BLKG
20H
IMAGING B
243H
IMAGING A
242H
V BLKG
20H
IMAGING B
242.5H

[Fig. 3]

2-3-3. RESTART RESET Mode

In the RESTART RESET (R.R) mode, information for one screen can be retrieved at any time. It is necessary to internally set the R.R mode in the camera to provide the R.R mode. See Section 2-4 "OPERATION MODE SETTING". Supply the HD and R.R signals to pin 6 and pin 7 of the 12-pin connector to obtain output.

• Input conditions for the HD and R.R signals

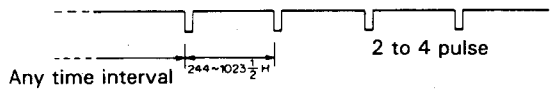
• Frequency (period)

HD signal: 15.734 KHz ± 1% (63.56 μs ± 1%)

Continuous pulse

R.R signal: 244 to 1023 1/2 H

2 to 4 pulses depending on the mode

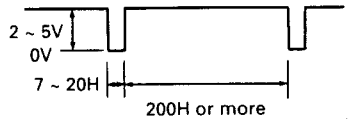


• Phase

The same phase conditions as for the HD and VD mode are applied to this mode. See Section 2-3-2.

Note

To operate after the power is just turn on, be sure to feed the two reset pulses as shown below to pin 7 of the 12-pin connector.



• Explanation of the timing chart

Figure 3 is the timing charts for each operation mode. The details of these timing charts are given below:

• Frame integration interlace mode

The R.R requires four pulses. Set the period of the R.R to (A + 1/2) H. A is an integer, 244 to 1023. It is 262 in the figure.

Shooting information during STORAGE 1 and STORAGE 2 is output in the intervals of IMAGING C (ODD) and IMAGING D (EVEN). The CCD is reset in the intervals of IMAGING A and IMAGING B. Therefore, signals output during these intervals are meaningless.

• Field integration interlace mode

The R.R requires three pulses. Set the period of the R.R to (A + 1/2) H. A is an integer, 244 to 1023. It is 262 in the figure.

Shooting information during STORAGE 1 and STORAGE 2 is output in the intervals of IMAGING B (ODD) and IMAGING C (EVEN). The CCD is reset in the interval of IMAGING A; therefore, signals output during this interval are irrelevant.

• Non-interlace mode

The R.R requires two pulses regardless of the storage mode. Set the period of the R.R to A H. A is an integer, 244 to 1023. It is 262 in the figure.

Shooting information in STORAGE 1 is output in the interval of IMAGING B. The CCD is reset in the interval of IMAGING A; therefore, signals output during this period are irrelevant.

2-4. OPERATION MODE SETTING

The XC-711 can switch the operation mode, depending on the use.

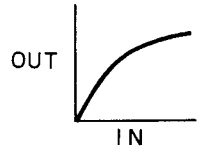
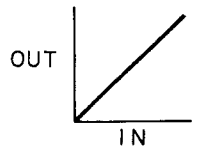
No.	Item	Board Name	Means
1	Gamma compensation mode	EN-72	Switch
2	White balance mode		
3	Y/C separation mode		Jumper
4	Chroma OFF mode*		
5	Gain mode	YC-38	Switch
6	G ON SYNC mode	RD-14	Jumper
7	SYNC output level		
8	Hue preset mode	PR-122	
9	Electronic Shutter mode	DR-83	Switch and jumper
10	Integration mode	TG-48	Jumper
11	Field inversion mode*		
12	Restart reset mode*	MB-222	
13	Synchronization mode		

*Chroma OFF mode, field inversion mode and restart reset mode can only be set in external synchronization mode.

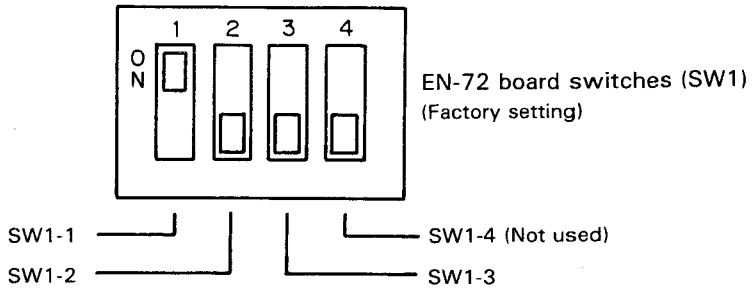
• Explanation of all operation modes

1. Gamma compensation mode (γ ON/γ OFF)
Set the gamma compensation of the RGB and VBS output signals by this mode. When the gamma compensation is set to ON, RGB and VBS signals for which gamma compensation is performed are output.
When it is set to OFF, no gamma compensation is performed for RGB and VBS signals. This setting provides RGB signals proportional to the amount of light from the object. The VBS output signal does not contain the chroma component when the gamma compensation is set to OFF. It is therefore a signal with only the luminance component.
The setting is performed with the DIP switch (SW1-1) on the EN-72 board. When this switch is set to ON, gamma compensation is ON. When it is set to OFF, gamma compensation is OFF. The factory setting is gamma ON.

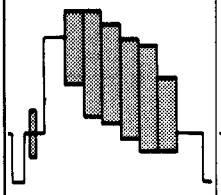
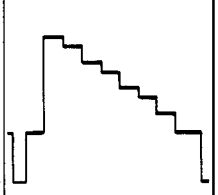
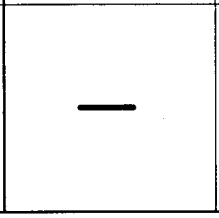
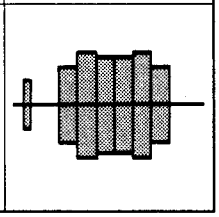
2. White balance mode (AUTO/PRESET)
Set the color temperature for the white balance adjustment.
When the white balance is set to AUTO, the white balance is adjusted automatically depending on the color temperature of the object. If it is set to PRESET, the white balance is adjusted according to a preset color temperature of 3200°K or 5600°K.
The setting of AUTO/PRESET is performed with the DIP switch (SW1-2) on the EN-72 board. When SW1-2 is set to ON, the mode is AUTO. When it is set to OFF, the mode is PRESET. And the setting of 3200°K/5600°K is performed with the DIP switch (SW1-3) on the same board. When SW1-3 is set to ON, 5600°K is preset. When it is set to OFF, 3200°K is preset. The factory settings are PRESET and 3200°K.
The color temperature of "5600°K" in PRESET is adjusted at the factory to comply with 5600°K. However, it is possible to change it with RV5 and RV6 of the MD-61 board.

SW1-1	Mode	Input/Output Characteristics
ON	γ ON (0.45)	
OFF	γ OFF (1.0)	

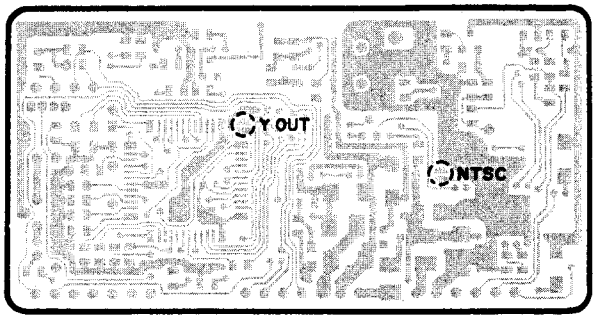
SW1-2	Mode	SW1-3	Color Temperature
ON	AUTO	ON	2600°K through 9000°K
		OFF	
OFF	PRESET	ON	5600°K (variable)
		OFF	3200°K (fixed)



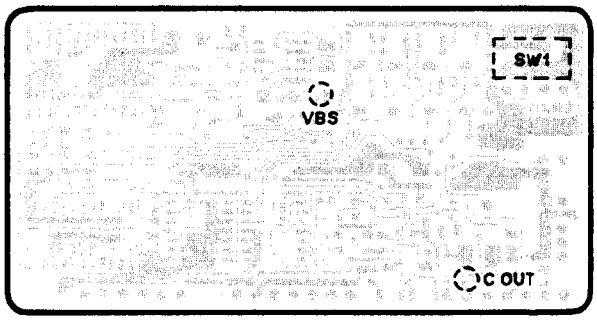
3. Y/C separate mode (COMPOSITE/SEPARATE)
Set the signal format of the video output signal from the D-SUB connector (rear pannel).
When it is set to COMPOSITE, the VBS signal is output from pin 6 of the DSUB connector.
However, in chroma signal OFF mode and in γ OFF mode, only the Y (luminance) signal is output.
When it is set to SEPARATE, the Y signal is output from pin 6, and the C (chroma) signal is output from pin 9 of the DSUB connector. However, in chroma signal OFF mode and in γ OFF mode no C signal is output from pin 9.
The setting is performed with the VBS, Y OUT, and C OUT traces on the EN-72 board.
To set to COMPOSITE, short-circuit VBS, and open Y OUT and C OUT. To set to SEPARATE, open VBS, and short-circuit Y OUT and C OUT.
The factory setting is COMPOSITE.

Mode		COMPOSITE	SEPARATE
VBS		Short	Open
Y OUT		Open	Short
C OUT			
DSUB output (example)	Pin 6		
	Pin 9		

4. Chroma signal OFF mode
Set this mode for cutting the chroma component of the video signal output in the external synchronization mode. The setting is performed with the NTSC trace on the EN-72 board.
To set the chroma signal OFF mode, short-circuit NTSC. If not, open NTSC.
The factory setting is chroma signal OFF mode and NTSC is short-circuited.

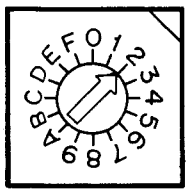


EN-72 BOARD A SIDE



EN-72 BOARD B SIDE

5. GAIN mode (AUTO/FIX)
Set the gain of the RGB and VBS output signals.
If it is set to AUTO, the AGC (Automatic Gain Control) functions. The maximum gain of AGC is +12 dB.
In FIX mode, the gain can be set to −6 dB, 0 dB, +6 dB or +12 dB.
The setting is performed by the rotary digital switch (SW1) on the YC-38 board.
The factory setting is 0 dB mode.



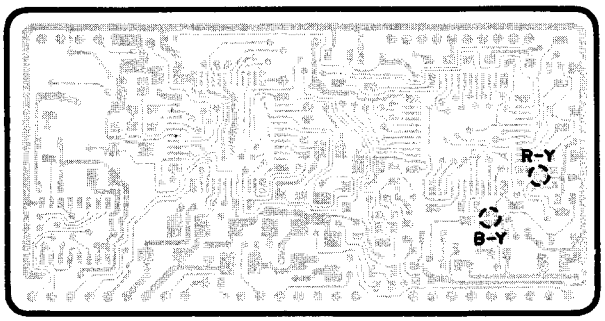
YC-38 board switch (SW1)
(Factory setting)

Position	Mode
0	AUTO
1	FIX −6 dB
2	FIX 0 dB
3	FIX +6 dB
4	FIX +12 dB

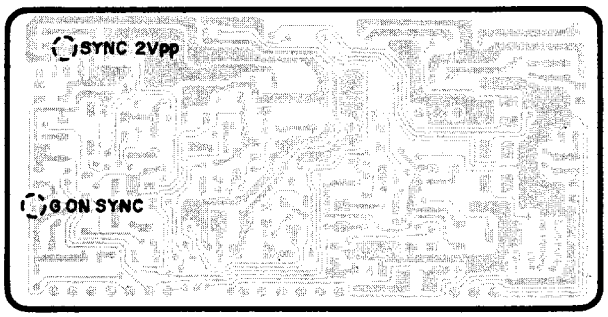
6. G ON SYNC mode
Set this mode for superimposing the SYNC signal to the G (Green) signal in the RGB output signal.
The setting is performed with the G ON SYNC trace on the RD-14 board.
To set to G ON SYNC mode, short-circuit this jumper. If you do not want to set to G ON SYNC mode, open the jumper.
The factory setting is not G ON SYNC mode. (G ON SYNC is open.)

7. SYNC output level (0.3 Vp-p/2.0 Vp-p)
Set the level of the SYNC output signal to be output from pin 7 of the DSUB connector.
The setting is performed with the SYNC 2 Vp-p trace on the RD-14 board.
When the jumper is short-circuited, the SYNC signal of about 2.0 Vp-p is output. When it is opened, the SYNC signal of about 0.3 Vp-p is output.
The sync output level is factory-set to 0.3 Vp-p.

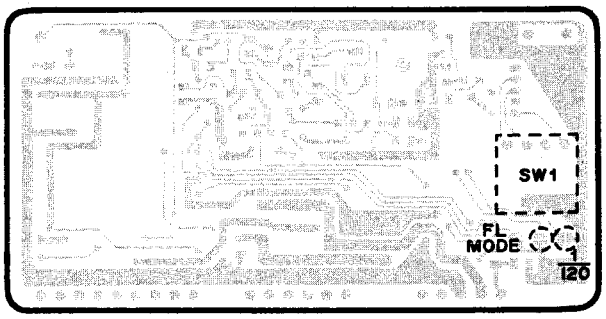
8. HUE PRESET mode
Set this mode for outputting the RGB and VBS output signals without HUE compensation.
The setting is performed with the R-Y and B-Y traces on the PR-122 board.
To set the HUE PRESET mode, short-circuit these two jumpers. When it is not to be set, open both jumpers.
The factory setting is not HUE PRESET mode. (R-Y and B-Y are both open.)



PR-122 BOARD A SIDE



RD-14 BOARD A SIDE

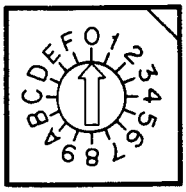


DR-83 BOARD (SUFFIX-12) B SIDE

9. Electronic shutter mode
Set the electronic shutter speed and the flickerless mode. The setting of the shutter speed is performed with the rotary digital switch (SW1) on the DR-83 board. The setting of the flickerless mode is performed with the FL MODE and 1/120 traces on DR-83 board.

Position	Shutter Speed	Flickerless Mode
0 through 7	OFF	×
8	1/60 sec.*	○
9	1/125 sec.	
A	1/250 sec.	
B	1/500 sec.	
C	1/1000 sec.	
D	1/2000 sec.	
E	1/4000 sec.	
F	1/10000 sec.	

*: only the freme integration mode.

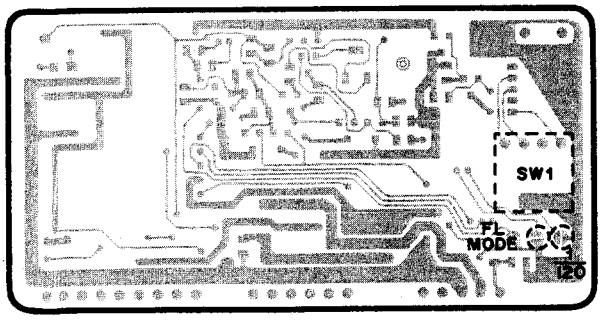


DR-83 board switch (SW1)
(Factory setting)

The flickerless mode is for suppressing the flicker of light produced depending upon the frequency of the power source.
Set the traces as follows.
If the flickerless mode is not to be set, open FL MODE.

Power Source Frequency	FL MODE	1/120	Shutter Speed
50 Hz area	Short	Open	1/100 sec.
60 Hz area	Short	Short	1/120 sec.

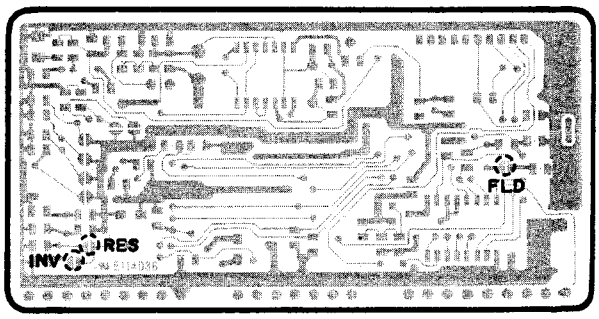
FL MODE and 1/120 are both factory-set to open.



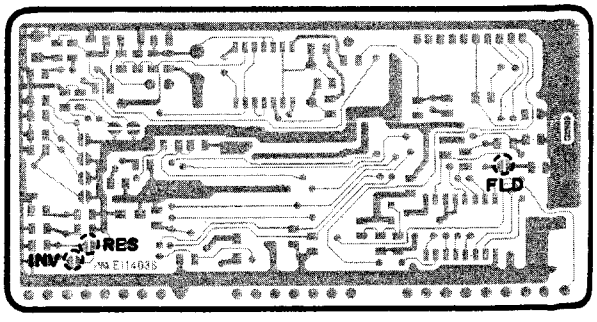
DR-83 BORAD (SUFFIX-11) B SIDE

10. Integration mode (FIELD/FRAME)
Set the period in which the signal charge is read from the CCD.
If it is set to FIELD, the signal charge is read from 2 pixel groups simultaneously, which is the field integration mode.
If it is set to FRAME, the signal charge is read from 2 pixel groups alternately, which is the frame integration mode.
In the frame integration mode, the sensitivity in non-interlace mode is half the sensitivity provided in interlace mode.
(Refer to Figure 2 on page 2-11)
The setting is performed with the FLD trace on the TG-48 board.
To set to FIELD, short-circuit FLD. To set to FRAME, open FLD.
The factory setting is FRAME. (FLD is open.)

11. Field inversion mode (NORMAL/INVERSE)
If this mode is set in external synchronization mode, the fields of the RGB and VBS output signals are inverted against the external synchronization signal.
If it is set to INVERSE, EVEN is output when the field of the external synchronization signal is ODD and ODD is output when it is EVEN. When NORMAL is set, the operation is the same as for the normal external synchronization signal: when the field of the external synchronization signal is ODD, ODD is output, and when it is EVEN, EVEN is output.
The setting is performed with the INV trace on the TG-48 board. To set to INVERSE, short-circuit INV. To set to NORMAL, open INV.
The factory setting is NORMAL. (INV is open.)



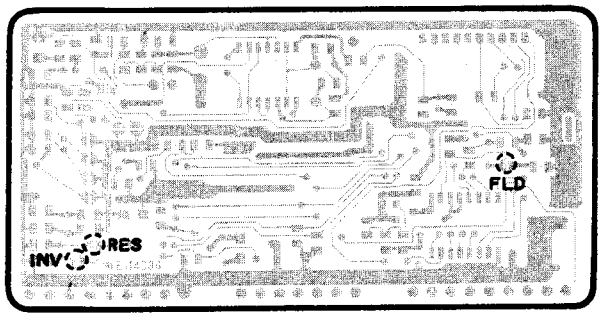
TG-48 BOARD (SUFFIX-12) B SIDE



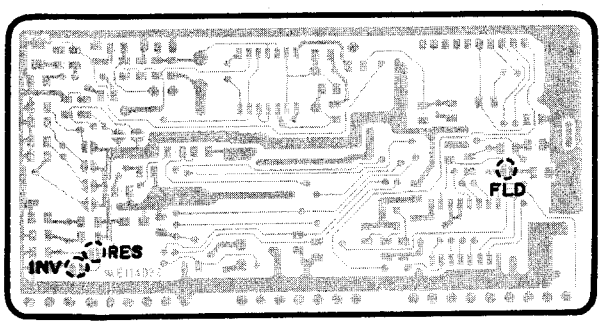
TG-48 BOARD (SUFFIX-11) B SIDE

12. RESTART RESET mode (NORMAL/RESET)
If this mode is set in external synchronization mode, the data of one screen is read out at the desired time.
The setting is performed with the RES trace on the TG-48 board and the NORM VD trace on the MB-222 board.
To set to RESET, short-circuit RES and open NORM VD.
To set to NORMAL, open RES and short-circuit NORM VD.
The factory setting is NORMAL.
(Refer to 2-3-3. RESTART RESET Mode on page 2-15.)

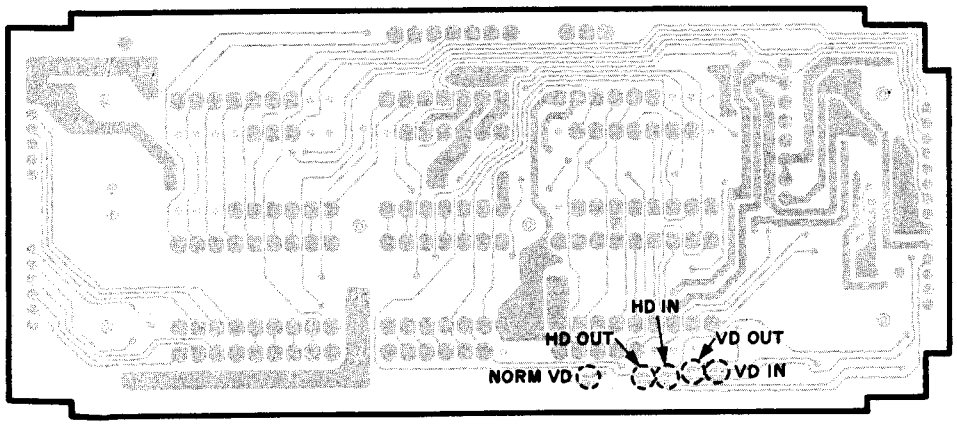
Mode / Jumper	NORMAL	RESET
RES	Open	Short
NORM VD	Short	Open



TG-48 BOARD (SUFFIX-11) B SIDE



TG-48 BOARD (SUFFIX-12) B SIDE



MB-222 BOARD A SIDE

13. Synchronization mode (INTERNAL/EXTERNAL)
Set to the external synchronization mode (EXTERNAL) or the internal synchronization mode (INTERNAL).
If it is set to EXTERNAL (HD and VD mode), the RGB and VBS output signals which are synchronized with the synchronization signals (HD and VD signals) input from the external equipment, are obtained.
If it is set to INTERNAL, the synchronization signal generated inside can be output.
The setting is performed with the HD IN, HD OUT, VD IN and VD OUT traces on the MB-222 board.
To set to EXTERNAL, short-circuit HD IN and VD IN while opening HD OUT and VD OUT. To set to INTERNAL, open HD IN and VD IN while short-circuiting HD OUT and VD OUT.
The factory setting is external synchronization Mode (EXTERNAL) (HD and VD mode).
(Refer to 2-3-2. HD and VD Mode on page 2-8.)

Mode / Jumper	EXTERNAL	INTERNAL
HD IN	Short	Open
VD IN		
HD OUT	Open	Short
VD OUT		

SECTION 3
THEORY OF OPERATION

3-1. OPERATION PRINCIPLE OF THE CCD

A CCD (Charge Coupled Device) consists of MOS (Metal-Oxide-Semiconductor) capacitors arranged in a regular array.
It basically performs three functions connected with handling charges.

1. Photoelectric conversion (photosensor)
Incident light generates charges on the MOS capacitors, with the quantity of charge being proportional to the brightness.

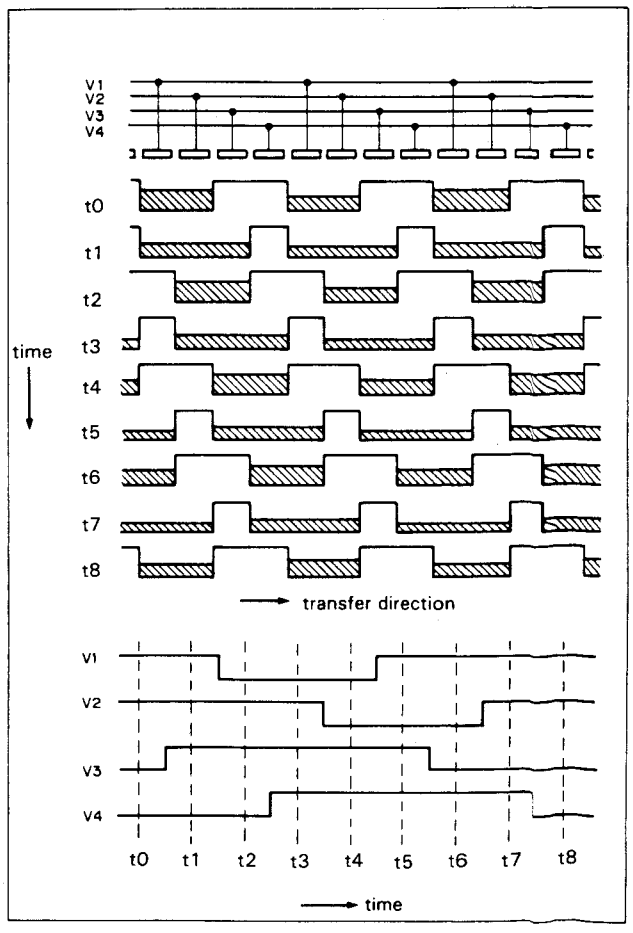
2. Accumulation of charges
When a voltage is applied to the electrodes of the MOS capacitors, an electric potential well is formed in the silicon layer. The charge is accumulated in this well.

3. Transmission of charge
When a high voltage is applied to the electrodes, a deeper well is formed; when a low voltage is applied, a shallower well is formed, In the CCD, this property is used to transmit the charge. When a high voltage is applied to the electrodes, a deep electric potential well is formed, and charge flows in from neighboring well. When this is repeated over and over among the regularly arranged electrodes, the charge is transferred from ones MOS capacitor to another. This is the principle of CCD charge transmission.

3-2. MECHANISM OF CCD CHARGE TRANSFER

The interline transfer system employed by the XC-711 transfers the charges proportional to the brightness of the image produced on the CCD sequentially as shown in Figure 3 on page 3-2. The charge proportional to the brightness of the object is detected by the photo sensor, and transfered to the neighboring vertical shift register. Then this charge is transfered to the horizontal shift register in vertical sequence. Then it is output through the output section in horizontal sequence.

1. Vertical transfer
The vertical shift register transfers charges using a four-phase drive mode. Figure 1 shows an example of the changes which can occur in potential wells in successive time intervals.
At t0, the electrode voltages are (V1 = V2) > (V3 = V4), so the potential wells are deeper toward the electrode at the higher voltages V1 and V2. Charges accumulate in these deep wells.
At t1, the electrode voltages are (V1 = V2 = V3) > (V4), so the charges accumulate in the wells toward the electrode at V1, V2 and V3.
At t2, the electrode voltages are (V2 = V3) > (V4 = V1), so the charges accumulate in the wells toward the electrode at V2 and V3.
Electrode voltage states at t3 and after are shown below.
t3 (V2 = V3 = V4) > (V1)
t4 (V3 = V4) > (V1 = V2)
t5 (V4) > (V1 = V2 = V3)
t6 (V4 = V1) > (V2 = V3)
t7 (V4 = V1 = V2) > (V3)
t8 (V1 = V2) > (V3 = V4) (Initial state)
These operations are repeated to execute the vertical transfer.



[Fig.1] Vertical transfer

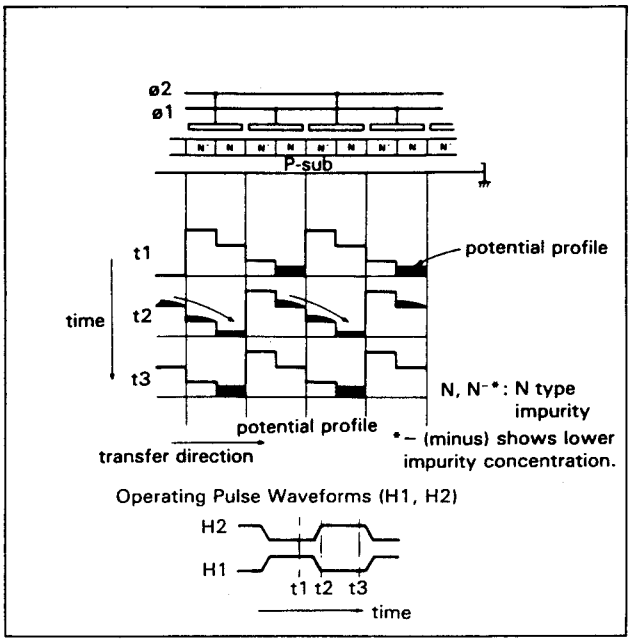
2. Horizontal transfer

The horizontal shift register transfers charges using a two-phase drive mode. Figure 2 shows an example of the changes which can occur in the potential wells in successive time intervals.

At t1, the electrode voltages are H1 > H2, so the potential wells are deeper toward the electrode of the higher voltage H1. The charges accumulate in these wells.

At t2, the electrode voltages H1 and H2 are inverted, the wells toward the electrode at voltage H2 becomes deeper while the wells toward the electrode at voltage H1 become shallower. So the wells at H2 are deeper than those at H1, the charge flows into the deeper wells toward the electrode at H2.

At t3, the electrode voltage have not changed since t2, so the charge flows into the wells at H2 and one transfer of charge is completed. These operations are repeated to execute the horizontal transfer.



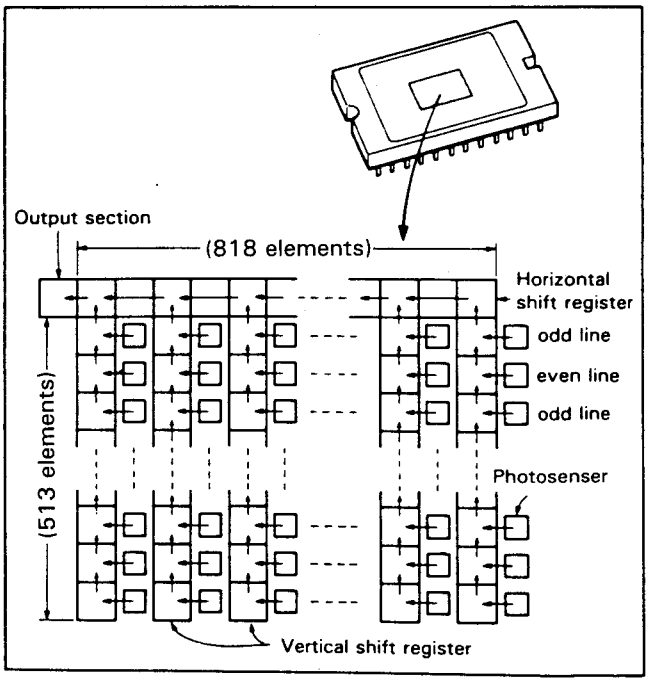
[Fig.2] Horizontal transfer

3-3. BI-26 BOARD

Light which comes through the camera lens strikes the CCD chip surface of IC1 on the BI-26 board. The surface of the CCD contains a number of photosensors.

The array is 818 horizontal photosensors by 513 vertical photosensors, so that there are a total of 419,634. The effective number of them is 768 photosensors by 493 photosensors, so there are total of 378,624. The color filters of R (Red), G (Green) and B (Blue) are formed on the effective picture elements in vertical stripe configuration. When the incident light passes the color filters, it is divided into the color elements R, G and B. The divided colors are converted into electrical charge proportional to the brightness of each color. The converted signal charge is read out by a register from the photosensor, and is transferred in sequence and fed to the output section. The register is subdivided into horizontal and vertical shift registrs. As shown in Fig. 3, there are 818 vertical rows of registers, while there is only one horizontal row of registers, across the top. Each converted charge is transmitted every field (frequency of VD) to the vertical shift register adjoining to the photosensor. The signal charge is then vertically transferred in sequence at the vertical transfer clock V1, V2, V3 and V4 (frequency of HD ;fH) to the horizontal register. The horizontal registers transfer charges horizontally at the horizontal transfer clock H1, H2 (= 910 fH) to the output section. The output from IC1 is output after the electrical charge has been converted to a voltage signal by the capacitor at the output section. It is then sent to the PR-122 board after passing buffer Q1.

IC2 is a horizontal clock driver. Q2 to Q7 are PG drivers which reset the electrical charge read out by one picture element.



[Fig.3] The interline-transfer organization of the CCD image sensors

3-4. PR-122 BOARD

This PC board has the function of generating the color difference signal and the luminance signal by the color signal of RGB from the CCD output signal.
Furthermore, it can perform white balance adjustment and gamma compensation for the RGB signal, and the hue compensation for the color difference signal.
In order to remove the noise component peculiar to the CCD output signal, the CCD output signal of the BI-26 board first passes through the sample and hold circuit (the double compensation sampling method) within IC1. Then it is divided into two signals, one of which is amplified in IC1, passes through Q1, Q2 and Q3 and is output as the signal that controls the lens iris. The other one passes through the AGC circuit in IC1 and is divided into two signals. One of the divided signals detects the auto gain, passes through the AGC detection circuit (consisting of Q5 and Q6, and the operational amplifier 1 within IC1), and is output to the YC-38 board via the MB-222 board (DET DC). The other signal passes through R3, decodes color signals of RGB at the sample and hold circuit for each color in IC1, and is output from IC1.
The gain of the AGC circuit is determined by the DC voltage (AGC CTL) transmitted from the YC-38 board. If there is no YC-38 board, it is determined by the DC voltage output from IC3. IC3 only operates at the time of adjustments.
Each color signal of RGB output from IC1 is input to IC2 after being passed through the LPF consisting of condenser and resistor, and is divided into two groups.
One of which is input to the white balance circuit. The white balance circuit is controlled by the DC voltage (R CONT and B CONT) created at the MD-61 board.
Then, it passes through the gamma compensation circuit and forms the R-Y and B-Y color difference signals at the matrix operation circuit. These color difference signals are output from IC2 after being passed through the hue compensation circuit.
If the gamma compensation mode is OFF, the gamma correction circuit, the matrix operation circuit and the hue correction circuit are bypassed and the RGB signals are output directly.
The other group is input to the luminance balance circuit. Then it is divided into two groups, one of which forms the luminance-balanced Y_H signal (R = G = B). The other forms the Y_L signal at the matrix operation circuit. Then these signals are output from IC2 as the Y_H signal and the Y_L-Y_H signal.
If the gamma compensation mode is OFF, Y_H is output as the Y_L signal and Y_L-Y_H is output as the G component.
The Y_L-Y_H signal output from IC2 passes through the active LPF (Q7 and Q8) and is output together with the Y_H signal to the EN-72 board via the MB-222 board. After being passed through the buffers (R-Y; Q19,B-Y; Q20), the color difference signals are output to the MD-61 and the EN-72 boards via the MB-222 board. However, the signals are output to the EN-72 board only after the band limitation has been performed by the each active LPF (R-Y; Q11 and Q12,R-Y; Q9 and Q10).

3-5. MD-61 BOARD

This PC board has the functions of reproducing RGB signals from the color difference signal and the G signal, and of generating the control signal of the white balance circuit (PR-122 board).

• Reproduction circuit for RGB signals
The color difference signal and the G signal transmitted from the PR-122 board are inversely amplified, and then the R signal and the B signal are reproduced by the linear matrix operation circuit. The R signal is output from IC1, the B signal is output from IC5. The G signal is separated from the Q10 emitter before being inversely amplified.
The RGB signals reproduced in this way, is then input into the group 0 of the analog switch IC3.
When the gamma compensation mode is OFF, the color difference signals (R-Y and B-Y) and the G signal transmitted from the PR-122 board are directly input into the group 1 of IC3.
IC3 is switched by the gamma compensation mode set by SW1 of the EN-72 board.
If gamma is ON, the group 0 is selected, and if gamma is OFF, the group 1 is selected.
All signals of group 0 or 1 output from IC3, are amplified. Then, they pass through the trap LPF (4.77 MHz) to remove the clock noise, and are output to the RD-14 board via the MB-222 board.

• White Balance Control Signal Generation Circuit
This circuit has the following 3 modes.

a. Preset White Balance (3200°K) Mode
It is preset by R47 to R50 in order to obtain the white balance when the object has a color temperature of 3200°K.

b. Preset White Balance (5600°K) Mode
It is preset by RV5 and RV6 in order to obtain the white balance when the object has a color temperature of 5600°K. However, by adjusting RV5 and RV6, the preset value of the color temperature can be changed to a range of 2600°K to 9000°K.

c. Auto White Balance (2600°K to 9000°K) Mode
The white balance detection signals (DET R, DET G and DET B) transmitted from the PR-122 board are each peak-held. Then, the detection voltage of G is compared to that of R and it is compared to that of B, at IC2. If there is a difference in the results of this operation, the output of IC2 changes.
If the detection voltage of G is lower, the output of IC2 (R; pin 7,B; pin 1) increases, and the amplifier gain of the R and B signals in the white balance circuit in IC2 of the PR-122 board, is decreased. (This amplifier gain is inversely proportional to the voltage applied.)
With this operation, the white balance is adjusted automatically according to the color temperature of the object.
RV2 is for offset adjustment of the detection voltage of R (pin 7 of IC2), RV4 is for offset adjustment of the detection voltage of B (pin 1 of IC2).

These three white balance control signals are input into analog switch IC4. IC4 is switched by SW1 of the EN-72 board.

Mode	EN-72 board SW1	
	SW1-2	SW1-3
a	OFF	OFF
b	OFF	ON
c	ON	OFF/ON

The output of IC4 is output to the PR-14 board via the MB-222 board.

3-6. RD-14 BOARD

This PC board processes the RGB signals transmitted from the MD-61 board, and the SYNC signal transmitted from the TG-48 board to be output to the external equipment.
The RGB signals are input into signal processors IC1 to IC3 respectively. (These ICs are for video signal processing. However, at this PC board, the only luminance system processing is used.)
At all ICs, the signals are output after contour compensation, level amplification, white clipping and setup addition have been performed.
The signals are then output to the CN-295 board via the MB-222 board after being passed through video amplifiers IC4 to IC6.
The SYNC signal is divided into two signals and sent to the CN-295 board in two ways. The one way is the G ON SYNC mode that adds the SYNC signal to the G signal and outputs it. This is performed by inputting the sync signal into IC2. Simultaneously, the SYNC level is adjusted at RV12.
The other one is outputting the SYNC signal independently: the divided SYNC signal is buffered (Q1) and then voltage-divided at R16 and R17, passed through the drive buffer (Q2 to Q5) and output. The SYNC output level at that time is 0.3 Vp-p, but it can be changed to 2 Vp-p by short-circuiting R16 (jumper 2Vpp).

3-7. EN-72 BOARD

This PC board is an encoder that forms the VBS signal from the luminance signals (Y_H and Y_L-Y_H) and the color difference signals (R-Y and B-Y) output from the PR-122 board. It contains the signal generation circuit that generates all synchronization signals and clocks for the encoder, and the switches (SW1) for setting the gamma compensation mode and the white balance mode.
The Y_H signal is input into IC2 after the 4.2 MHz band limitation was performed at LPF. The Y_L-Y_H signal is input into IC2 after being passed through analog switch IC1.
The Y_H signal is added with the Y_L-Y_H signal after passing the contour compensation circuit, and becomes the Y signal. The Y signal consists of the low-frequency component (Y_L) which determines the visibility, and the high-frequency component (Y_H) which determines the resolution.
The Y signal is sent to the encoder circuit after signal processing such as level amplification, white clipping, and setup addition have been performed.
The R-Y and B-Y signals are directly input into IC2. They are added with the burst signal to become the chroma signal after clamping and balanced modulation have been performed. This balanced modulation can provide a stable carrier balance due to the auto carrier balance function, the circuit being a nonadjustable circuit.
The chroma signal is once output from IC2 and then input into IC2 again after being passed through the BPF (L6 and C45). At that time, it is possible to divide the chroma signal before BPF and output it to the YC-38 board. The chroma signal which is again input into IC2 is composited with the Y signal, becomes the VBS signal and is output from IC2. Then it is divided into two signals, one of which passes through video amplifier IC3 and is output to the CN-295 board via the MB-222 board. The other one is directly output to the YC-38 board via the MB-222 board.
As the Y signal itself is also output from IC2 at the same time, it can be output to the YC-38 board instead of the VBS signal. IC1 switches over the control voltage in order to perform the level amplification at IC2 suitable for the gamma compensation mode (γON/γOFF).
When gamma is ON, the voltage divided at RV1 is output from IC1, when gamma is OFF, the voltage divided at RV2 is output from IC1.
With gamma OFF, analog switch Q4 is set to ON so that no chroma signal is output from IC2. In this mode, the VBS output does not contain the chroma component but only the luminance component.
IC6 is a synchronization signal generator that generates the timing pulse necessary at IC2. This is a double synchronization generator that uses IC4 of the TG-48 board as master generator and IC6 of the EN-72 board as slave generator.
The SYNC signal (M SYNC) transmitted from the master generator is input into IC4 to create the H reset pulse and the V reset pulse. The H reset pulse is input to IC6 after phase adjustment by IC5. The V reset pulse is input into IC6 directly. The EXT/$\overline{INT}$ signal of IC4 is input into the EXT terminal of IC6 so that IC6 becomes the slave SYNC generator for the master SYNC generator.
The clock (CLK) transmitted from the TG-48 board is input into the 4FSC input of IC2 after having been inverted in IC6.

3-8. YC-38 BOARD

This PC board has a Y amplifier and a C amplifier to correspond to the Y/C separate outputs, and a circuit that sets and outputs the control voltage for the AGC circuit of the PR-122 board.
If the Y/C separate mode is set, the Y signal and the C signal are transmitted from the EN-72 board. If it is not set, VBS signal instead of Y signal is transmitted. In that case, the C signal is not transmitted. IC1 is the video amplifier for the Y signal. IC2 is the video amplifier for the C signal. The outputs of these amplifiers are sent to the CN-295 board via the MB-222 board.
The INHIBIT signal output from this PC board disables analog switch IC3 of the PR-122 board so that the camera gain setting can be performed on the YC-38 board. RV3 to RV6 set the gain control voltage. The DET DC signal is a gain control voltage signal in AGC mode. They are switched at analog switch IC3 depending upon the setting of SW1. The output (AGC CTL) of IC3 is sent to the PR-122 board via the MB-222 board.

3-9. CN-295 BOARD

This PC board is united with connectors of the rear panel. All the signal exchanges with the external equipment is performed here.
The RGB signal, the SYNC signal and the VBS signal (or the luminance signal and the chroma signal) are output from the 9-pin DSUB connector.
The VBS signal (or luminance signal) is output from the BNC connector.
At the 12-pin multi connector, the power supply voltage (+12 V) and the external synchronization signal (EXT HD, EXT VD or VBS and VS) are input, and the VBS signal and the synchronization signal (CLK, HD, VD) are output.
The 4-pin female connector outputs the power (+12 V) and the detection video signal for the auto iris lens.
For details, refer to 1-3. PARTS LOCATION, FUNCTION AND OPERATION.

3-10. MB-222 BOARD

This PC board contains the external synchronization signal separation circuit, the synchronization signal output buffer and the DC-DC converter. Furthermore, it serves as the mother PC board.

• External Synchronization Signal Separation Circuit
The VBS signal, the VS signal or the VD signal can be input into the EXT VD line from the external equipment. With the VBS signal or the VS signal, pass through buffer Q2, and the chroma component is suppressed by the LPF (R31 and C19).
Then, the SYNC component in the signal is separated and detected by Q3. This SYNC signal is wave-shaped in IC1 and then output to the TG-48 board (EX VD).
With the VD signal, the above circuit works simply as a wave-shape circuit so that the signal has the sufficient amplitude. When there is no signal, it is set to High level.
The HD signal is input into the EXT HD line from the external equipment. The HD signal passes through buffer Q1 and is output (EX HD) to the TG-48 board after being inversely wave-shaped at IC1. When there is no signal, it becomes Low level.

• Synchronization Signal Output Buffer
The VD signal, HD signal and CLK signal sent from the TG-48 board, are output to the CN-295 board after being buffered at this PC board. Q4 is the buffer for the VD signal, Q5 for the HD signal and Q6 for the CLK signal. If the internal synchronization mode is not set, the VD signal and the HD signal cannot be output to the CN-295 board.

• DC-DC Converter
The power (+12 V) provided from the external equipment is switched to different voltages of −5 V, +5 V, +7 V, +15 V and +25 V by the DC-DC converter and supplied to every PC board.

3-11. TG-48 BOARD

This PC board contains a synchronization signal generator circuit for external synchronization modes, a timing pulse generator circuit for driving the CCD and for signal processing.
IC4 detects whether there is the external synchronization signal or not. If external synchronization signal is input, it is automatically switched to external synchronization mode. It outputs synchronization signals synchronized to this signal.

SYNC: composite SYNC signal (master SYNC)
BLK: blanking signal
HD, VD: horizontal and vertical synchronization signals
FLD: field discrimination signal
INT/EXT: synchronization mode discrimination flag

In the 28 MHz oscillator circuit there are two kinds of oscillations: the liquid cristal oscillation and the quartz oscillation.
In external synchronization mode, the liquid crystal oscillator circuit operates. This liquid crystal oscillator circuit is a VCO and composes the PLL by IC4 and phase comparator IC6. Therefore, it outputs a clock completely locked- in to the external synchronization signal.
In internal synchronization signal mode, the quartz oscillator circuit operates and outputs a clock of 28.6363 MHz. One of these clocks is input into IC2 together with the HD and VD signals of IC4, and the timing pulses for driving the CCD and for signal processing are generated.

CLK: 14 MHz (910 f_H) clock
XPG: CCD precharge gate clock
XH1, XH2: 2-phase clock for horizontal CCD transfer
XV1 to XV4: 4-phase clock for vertical CCD transfer
SHP, SHD: double correlation sampling pulse for the CCD output signal

IC1 is the system data writing completion ROM supplied with the CCD. If the ROM has the address for compensation of defects in the CCD, the same serial number as the CCD is attached on it.
IC3 makes the WINDOW signal from the VD signal.

3-12. DR-83 BOARD

This PC board contains the clock drive circuit for vertical transfer of the CCD and the electronic shutter control circuit.

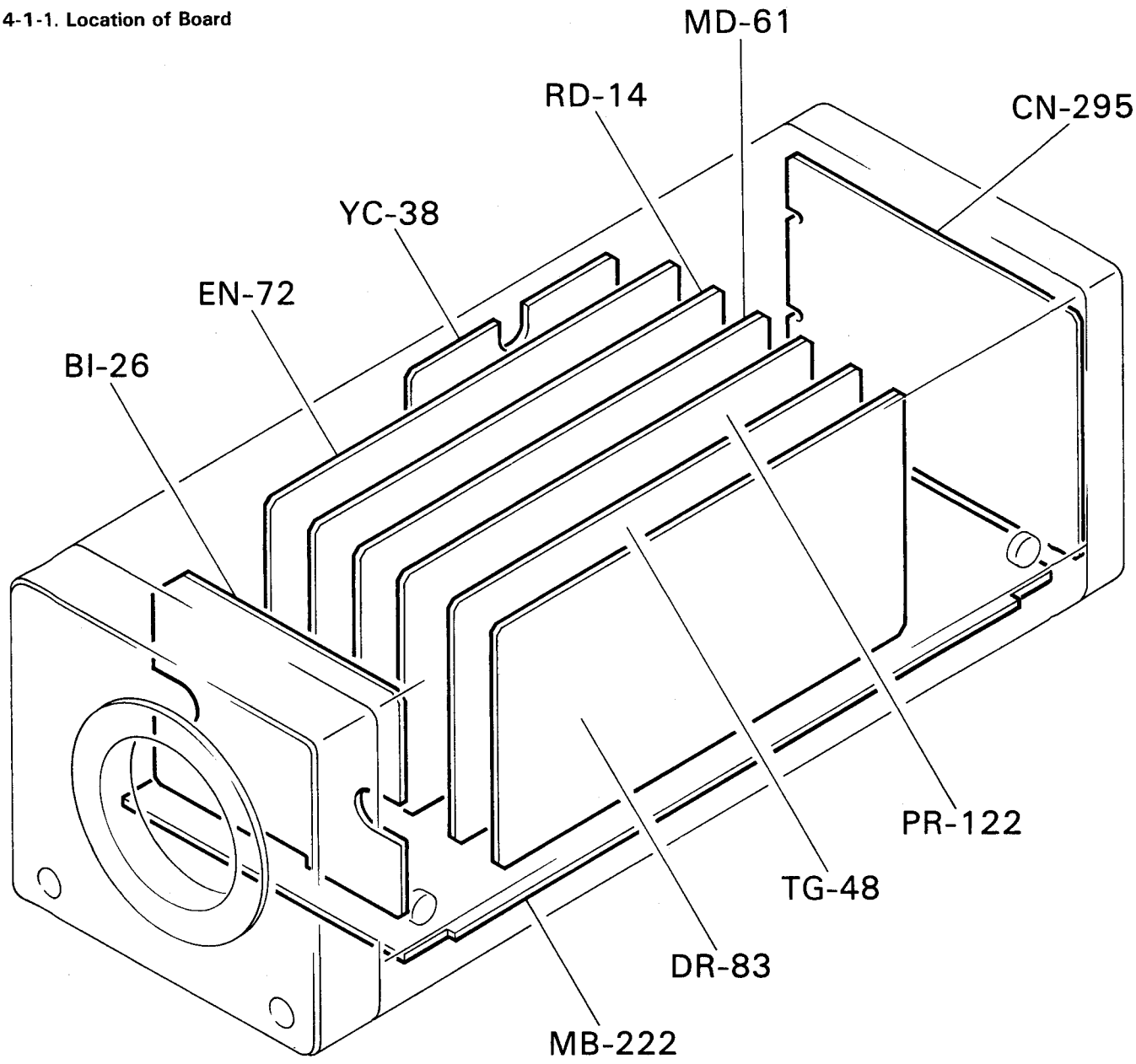
• Clock Drive Circuit for Vertical Transfer of CCD
After pulses XV1 to XV4, XSG1 and XSG2 sent from the TG-48 board have been amplified at clock driver IC1, CCD drive pulses V1 to V4 are output. These drive pulses are clamped at D7 to D9 and output to the BI-26 board via the MB-222 board. The clamp voltage at this time is a negative voltage VL created by the VL output of IC1 and D6. The negative voltage VL is also output to the BI-26 board via the MB-222 board.
Q1 to Q3 are the regulators that form the power supply voltage necessary for IC1.

• Electronic Shutter Control Circuit
The signals XV4, XSG1, PS, HD and VD sent from the TG-48 board are input here, and the pulse (XSUB) for the electronic shutter is generated at IC3. XSUB passes through the drive buffer of Q7 to Q10 and is output (SUB CTL) to the BI-26 board via the MB-222 board after being clamped (D1). The clamp voltage at that time has been created by regulator (Q4 to Q6), and becomes the normal bias voltage for the SUB terminal of the CCD.
The electronic shutter is operated by modulating the bias voltage for the SUB terminal with XSUB.
The speed of the electronic shutter (time of storage of electrical charge) is set by SW1.

SECTION 4
ALIGNMENT

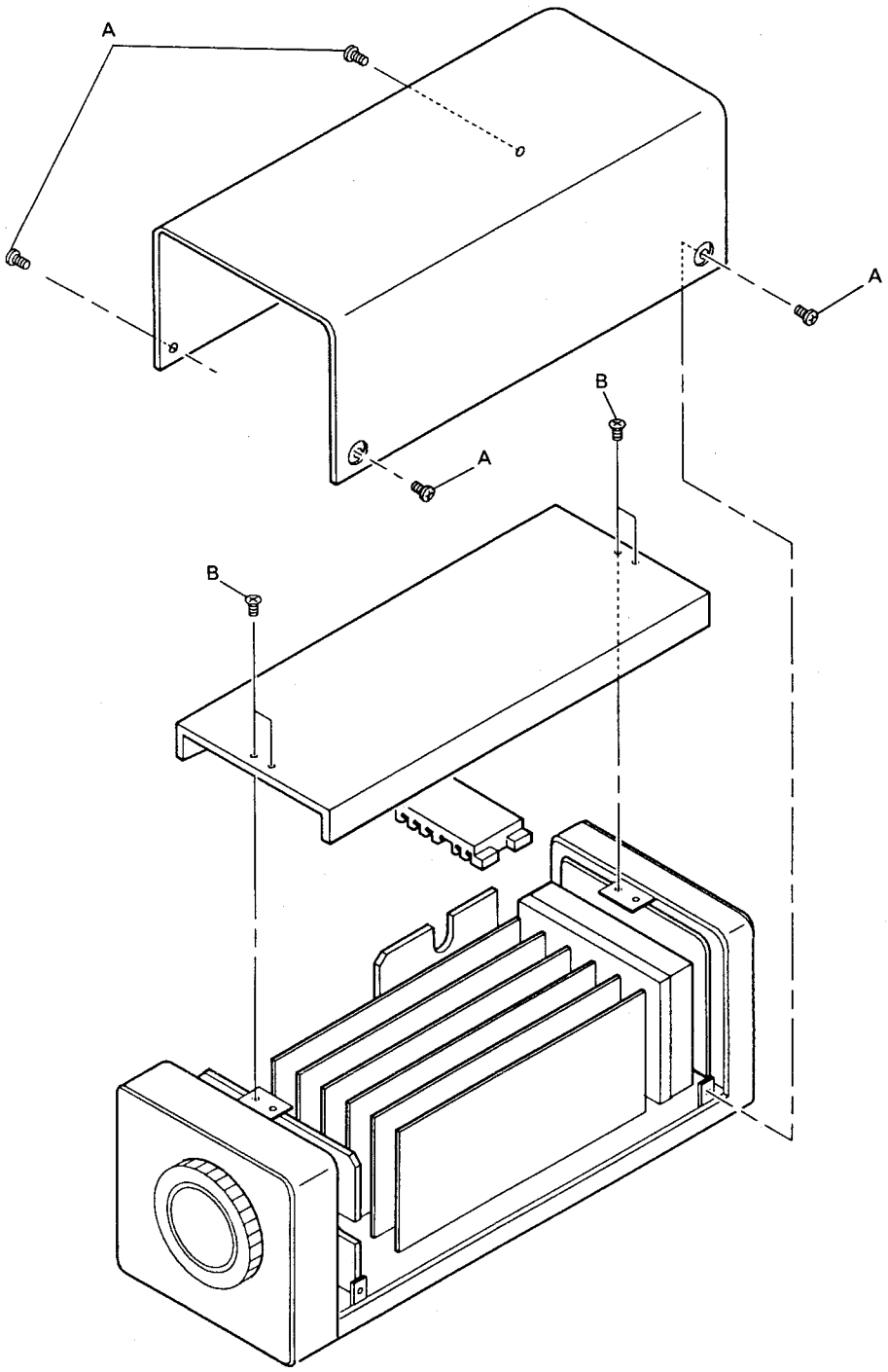
4-1. PREPARATOR INFORMATION ADJUSTMENT

4-1-1. Location of Board

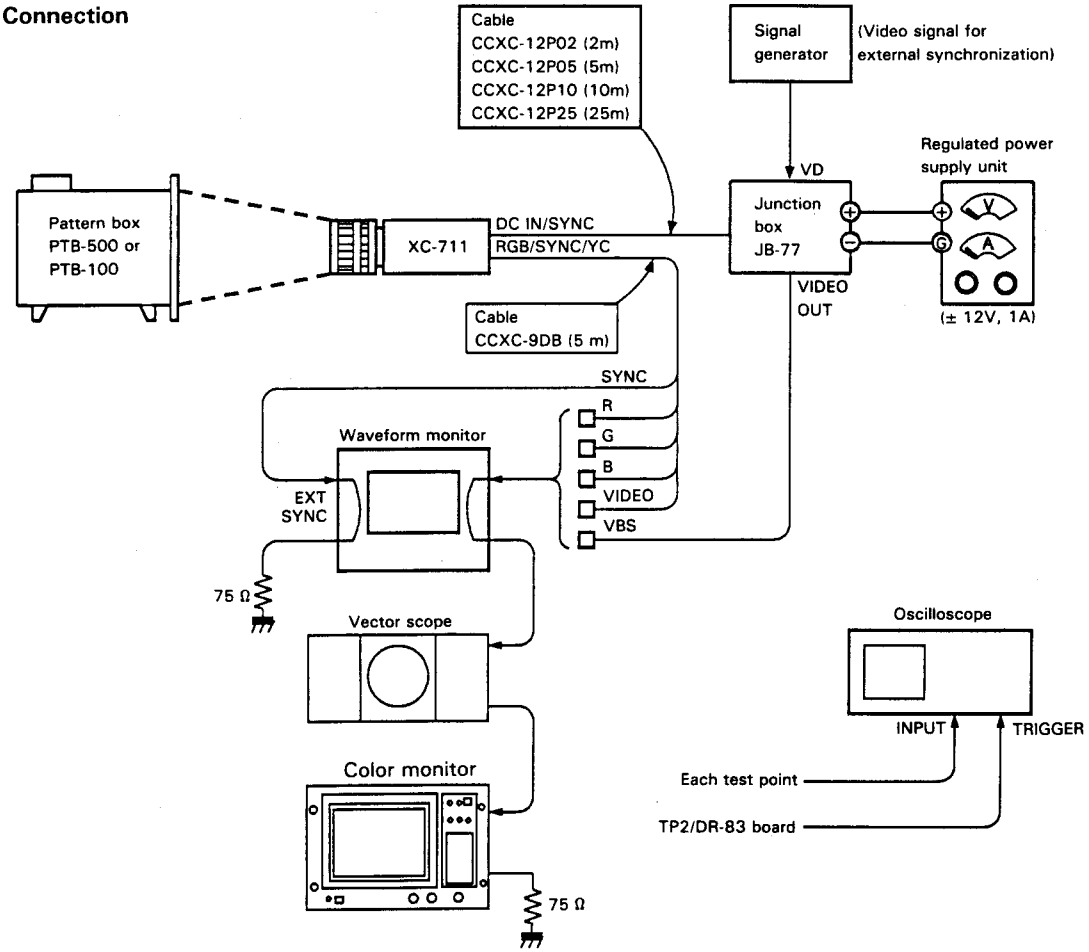


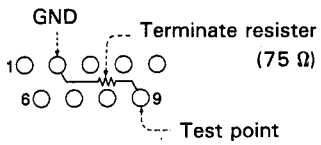
4-1-2. Removal of Outer Panels

Remove the four fixing screws A (Precision + P2 x 4), and remove the camera cover.
Remove the four fixing screws B (Precision + K2 x 4), which is fixing the STAY to the chassis, then remove the PC BOARD HOLDER.



4-1-3. Connection

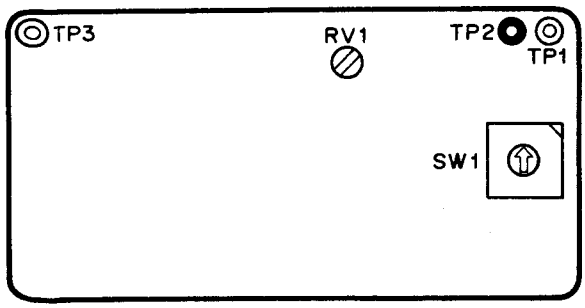




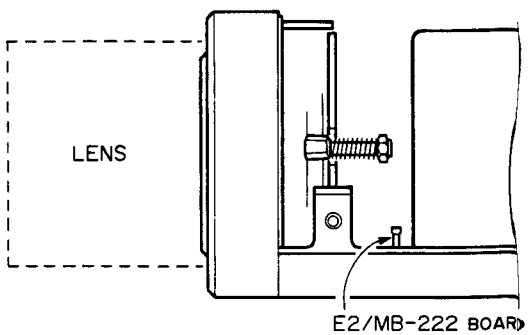
CN-295 board A side
(DSUB connector)

- Termination at the oscilloscope
  For "4-4-8. C Gain Adjustment (YC-38 Board)", terminate the measuring point at 75 ohms, then observe the waveform and adjust it. (Refer to the Fig. on the right.)

- Trigger input of the oscilloscope
  For observing the waveform by using an oscilloscope, a trigger input is necessary.
  Input the HD signal (TP2/DR-83 board) to the trigger input.
  Connect the GND to the E2/MB-222 board.



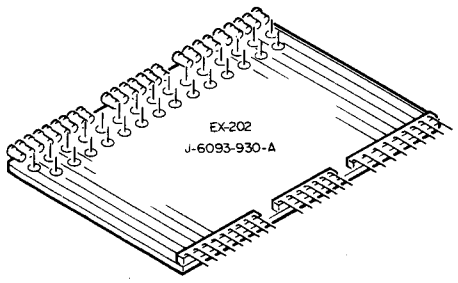
DR-83 BOARD (B SIDE)



4-1-4. Adjustment Fixtures and Equipment

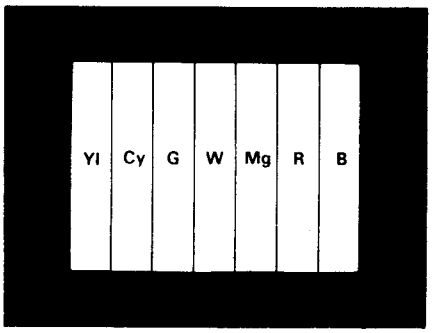
J-6093-930-A	Extension Board (EX-202)

• For PR-122 board adjustment



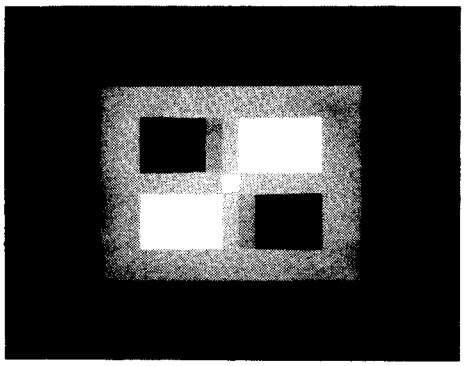
J-6020-250-A	Color-Bar Chart

• For color adjustment.



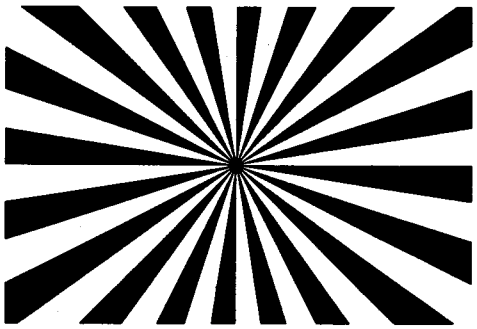
J-6026-130-B	Grayscale Chart

• For video level and gamma adjustment, etc.



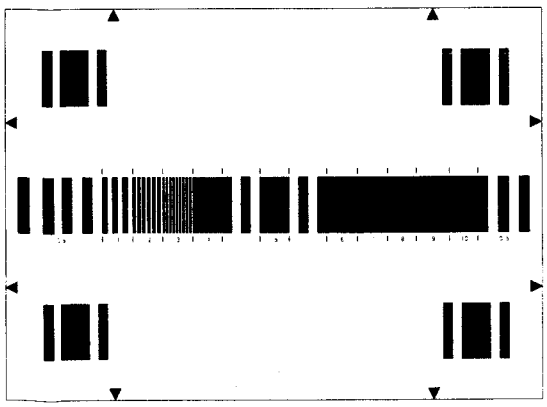
J-6024-340-B	Siemens Star chart

• For back focus adjustment

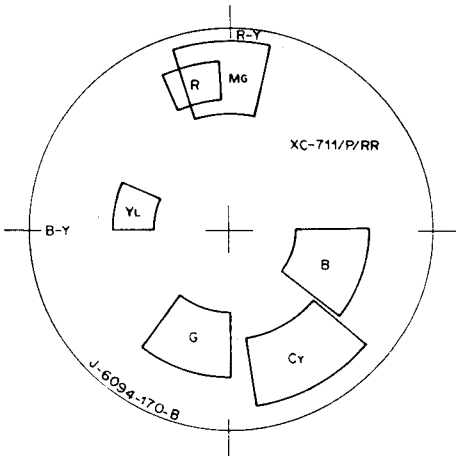


J-6021-910-A	Inmega Chart

• For aparture Adjustment

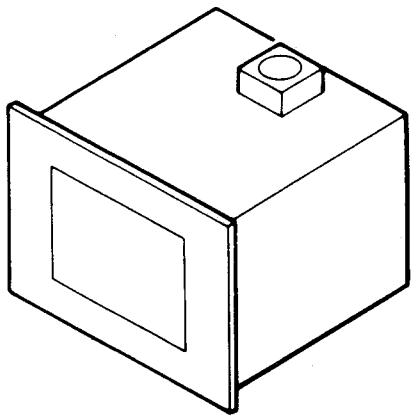


J-6094-170-B	Vectorscope Scale

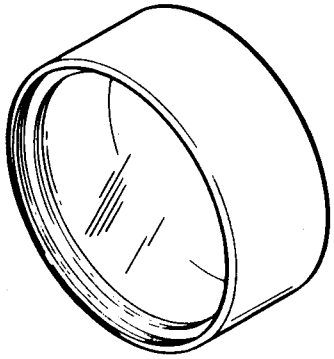


J-6020-490-A	Pattern Box PTB-100 (90 to 130 V)
J-6020-140-A	Pattern Box PTB-500 (90 to 240 V)

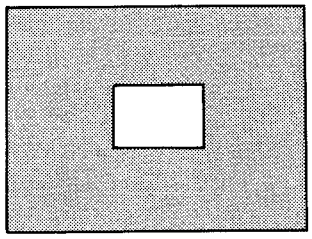
• Light source for test charts



J-6080-058-A	LB140 Filter
J-6029-590-A	LB200 Filter



White Window Chart



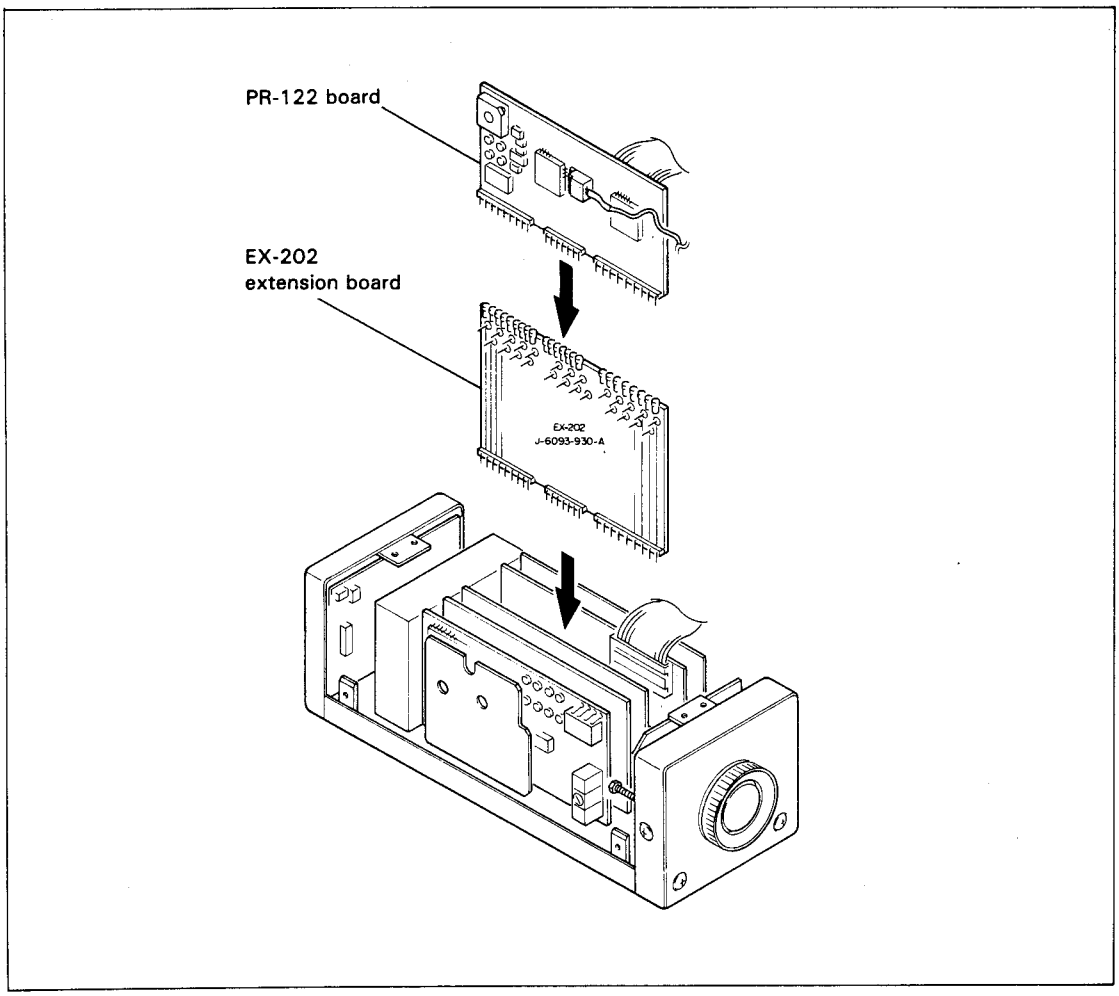
Make a hole in the center of black paper as shown in the figure.

Commercial measuring equipment and fixture

- Dual Trace Oscilloscope
- Vectorscope
- Wareform Monitor (WFM)
- Frequency Counter
- Digital Voltmeter
- Color Monitor
- Lens (C mount and manual iris type)

4-1-5. Mounting of EX-202 Extension Board

1. Remove the outer panels by "4-1-2. Removal of Outer Panels".
2. Remove the DR-83 board.
3. Remove the TG-48 board.
4. Remove the PR-122 board.
5. Mount the extension board to the position where the PR-122 board has been removed from.
6. Mount the PR-122 board on the extension board.



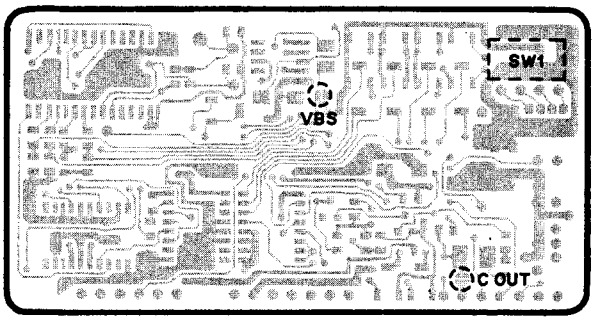
7. Mount the TG-48 board in place.
8. Mount the DR-83 board in place.

NOTE: EX-202 can be used not only for extension of the PR-122 board but also for the DR-83, TG-48, MD-61, RD-14 and EN-72 boards.

4-2. PREPARATION

4-2-1. Operation Before Adjustment.

Remove the YC-38 board from the MB-222 board, and short-circuit the "C OUT" jumper of the EN-72 board.



EN-72 BOARD B SIDE

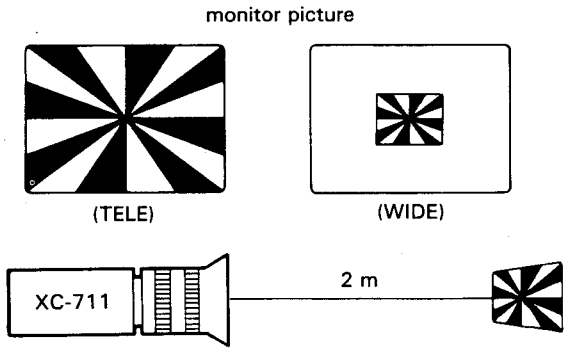
Mount the PR-122 board to the MB-222 board via the EX-202 extension board.
Refer to "4-1-5. Mounting of EX-202 Extension Board".
Set the switches as follows

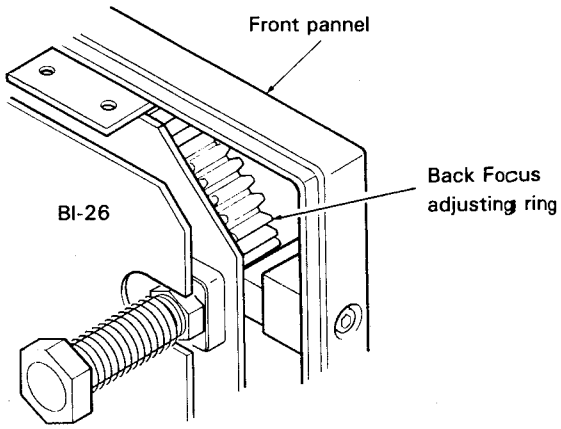
- PR-122 board. SW1 ..... "2"
- DR-83 board. SW1 ..... "0"
- EN-72 board. SW1-1 ..... "OFF"
  -2 ..... "OFF"
  -3 ..... "OFF"
  -4 ..... "OFF"

4-2-2. Mechanical Back Focus Adjustment

Subject: Siemens Star chart
Lens iris: Open
Equipment: Color monitor
Test point: VBS OUT
Adjust:

1. Set the zoom control at TELE so as to obtain the maximum multiplication factor. Optically focus the image so as to obtain the maximum resolution.
2. Set the zoom control at WIDE so as to obtain the minimum multiplication factor. Do not optically focus the image at thie time.
   Check whether the image is focused, on the monitor while turning the zoom control from TELE to WIDE.
   If the image is not focused, properly set at back focus as follows.
3. When the zooming mechanism is set at WIDE, turn the back focus adjusting ring.
4. Repeat step 1 through 3 several times.





4-3. BASIS SYSTEM

4-3-1. VCO Voltage Adjustment

Preparation: Supplying the HD and VD signals (or VS/VBS signal)
Equipment: Digital voltmeter
Test point: TP1 (GND: E2/MB-222 board)/TG-48 board
Adj.point: ◐CV1/TG-48 board
Spec.: 2.8 ± 0.1 V

NOTE: When this adjustment is finished, no HD and VD signals are necessary any more. Turn off the power of the external synchronization signal generator.

4-3-2. CCD Substratum Voltage Adjustment

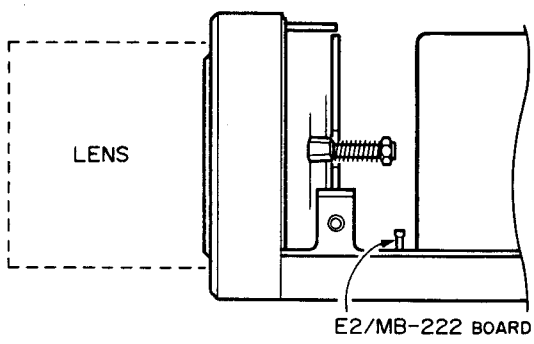
Equipment: Digital voltmeter
Test point: TP3 (GND: E2/MB-222 board)/DR-83 board
Adj.point: ◐RV1/DR-83 board
Spec.: Establishment value ± 0.1 V

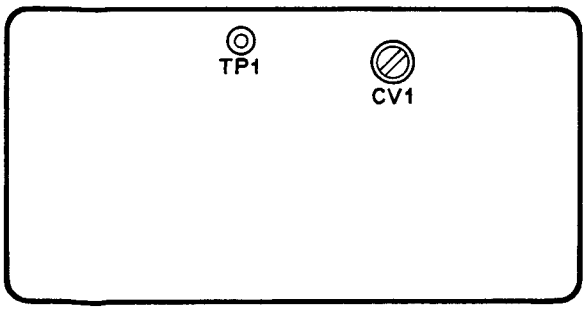
Establishment value
When you replace the CCD image device, refer to the 2-digit code indicated on the rear of the new CCD image device.
If you do not replace the CCD image device, refer to the 2-digit code indicated on the label stuck on the inside of the front panel.
When you replace the CCD image device, make sure to change the code, indicated on the label stuck on the inside of the front panel, to the code indicated on the rear of the new CCD image device.
2 digit-code display: □□ ← Decimal
Integral

The code integrals and the real value correspond with each other as follows:

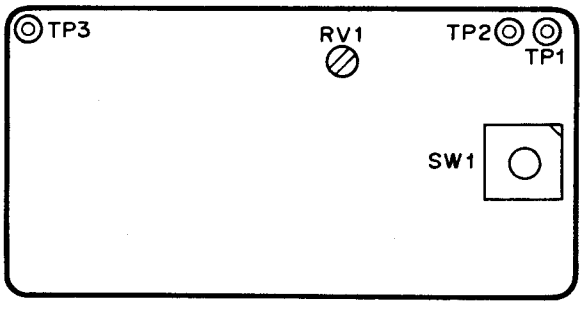
Code integral	9	A	B	C	D	E	F	G	H	I	J
Value	9	10	11	12	13	14	15	16	17	18	19

<Example> F5 → 15.5 (V)





TG-48 BOARD (A SIDE)



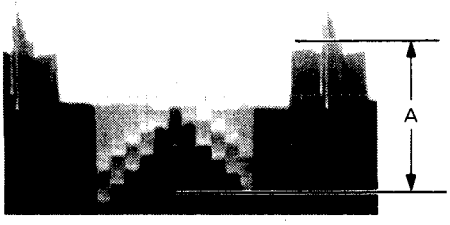
DR-83 BOARD (B SIDE)

4-4. PROCESS SYSTEM

4-4-1. Video Gain Adjustment (PR-122 Board)

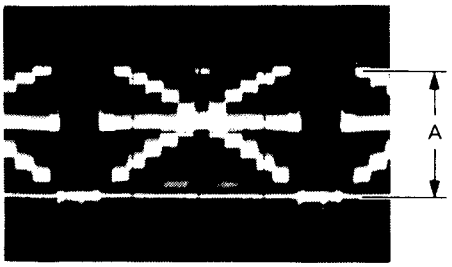
Subject: Grayscale chart
Adjust:

1. Equipment: Oscilloscope
   Test point: TP1 (GND: Pin 9/Extension board)/PR-122 board
   Adj. point: Lens iris
   Spec.: A = 94 ± 10 mV



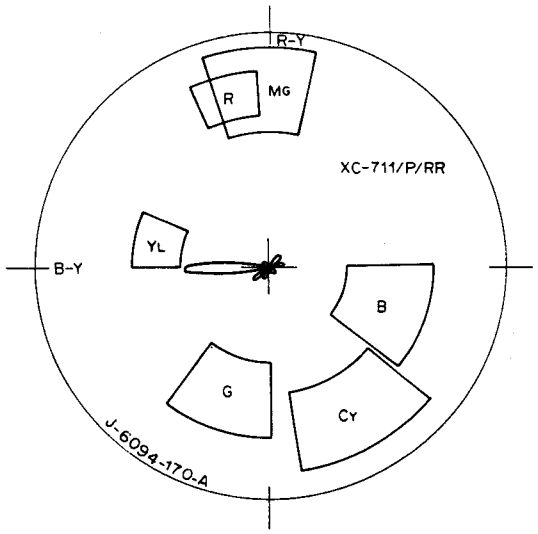
2. Preparation: SW1/PR-122 board .... "4"
   Equipment: Oscilloscope
   Test point: TP2 (GND: Pin 9/Extension board)/PR-122 board
   Adj. point: ◐RV14/PR-122 board
   Spec.: A = 1000 ± 40 mV

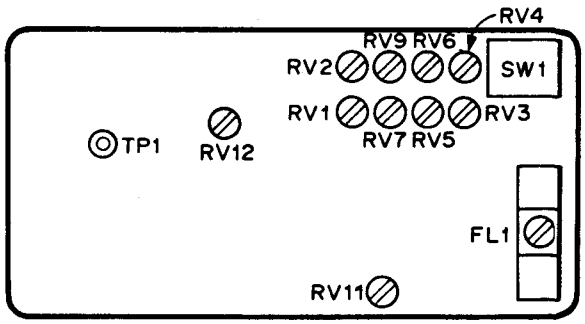
3. Preparation: SW1/PR-122 board .... "2"
   Equipment: Oscilloscope
   Test point: TP2 (GND: Pin 9/Extension board)/PR-122 board
   Adj. point: ◐RV12/PR-122 board
   Spec.: A = 250 ± 10 mV



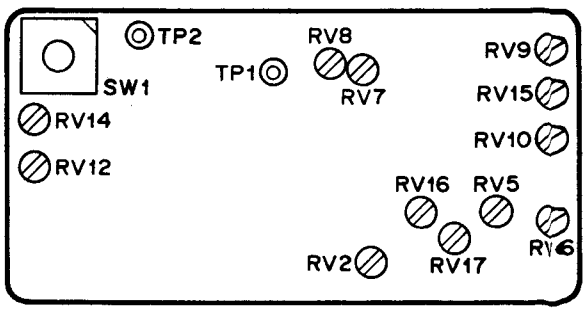
Adjust 2 and 3

4. Equipment: Vectorscope
   Test point: VBS OUT
   Adj. point: ◐RV7, ◐RV8/PR-122 board (alternately adjust)
   Spec.: Bright spot is at the center of the vectorscope screen.





EN-72 BOARD (B SIDE)



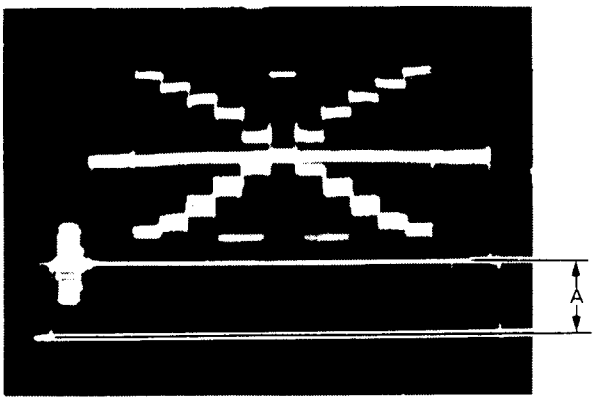
PR-122 BOARD (A SIDE)

4-4-2. SYNC Level Adjustment (EN-72 Board)

Subject: Grayscale chart
Preparation: ◐RV9/PR-122 board .... counterclockwise full
◐RV16/PR-122 board... clockwise full
◐RV17/PR-122 board... mechanical center
◐RV4/EN-72 board .... clockwise full
◐RV5/EN-72 board .... clockwise full

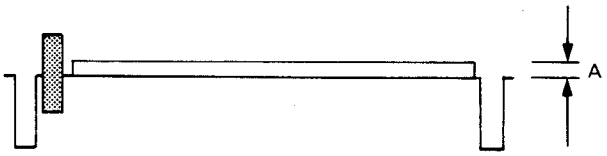
Adjust:

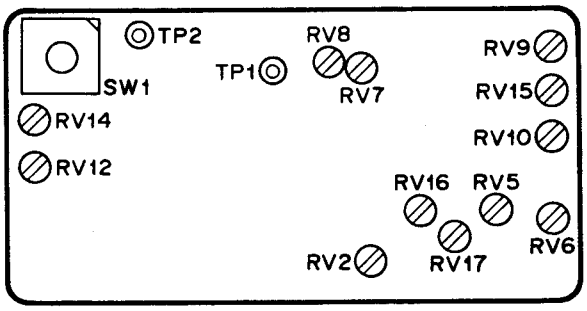
1. Equipment: Waveform monitor
   Test point: VBS OUT
   Adj. point: ◐RV7/EN-72 board
   Spec.: A = 40 ± 1 IRE



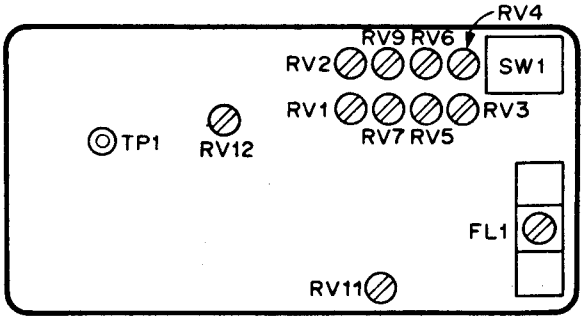
4-4-3. Setup Level Adjustment (EN-72 Board)

Lens iris: Closed "C"
Equipment: Waveform monitor
Test point: VBS OUT
Adj. point: ◐RV6/EN-72 board
Spec.: A = 7.5 ± 1 IRE





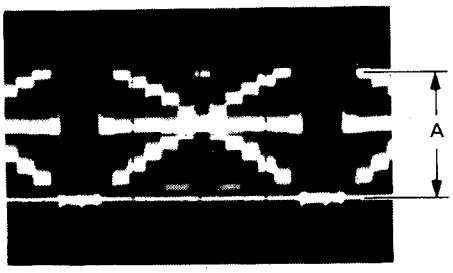
PR-122 BOARD (A SIDE)



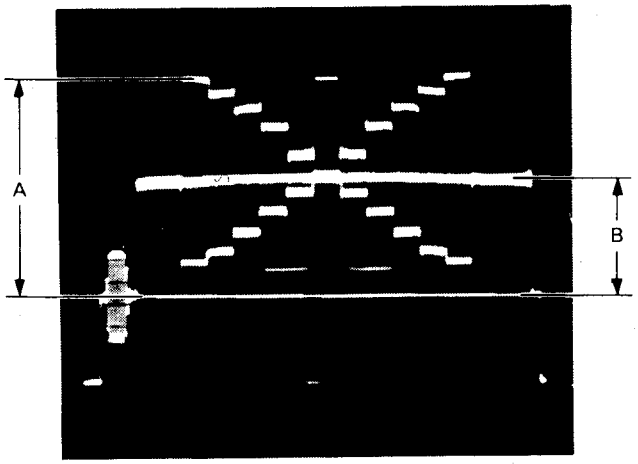
EN-72 BOARD (B SIDE)

4-4-4. Y Level Adjust (EN-72/PR-122 Boards)

Subject: Grayscale chart
Adjust:
1. Equipment: Oscilloscope
   Test point: TP2 (GND: Pin9/Extension board)/PR-122 board
   Adj. point: Lens iris
   Spec.: A = 400 ± 20 mV

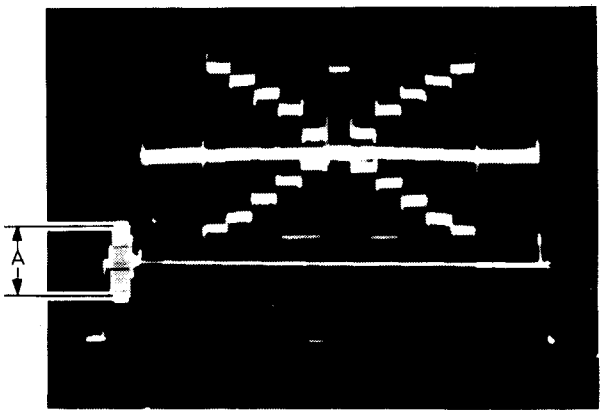


2. Equipment: Waveform monitor
   Preparation: SW1-1/EN-72 board .... "ON"
   Test point: VBS OUT
   Adj. point 1: ◐ RV1/EN-72 board
   Spec. 1: A = 100 ± 2 IRE
   Adj. point 2: ◐ RV17/PR-122 board
   Spec. 2: B = 50 ± 2 IRE
   Repeat adj. point 1 and adj point 2.



4-4-5. Burst Level Adjustment (EN-72 Board)

Subject: Grayscale chart
Equipment: Waveform monitor
Test point: VBS OUT
Adj. point: ◐RV11/EN-72 board
Spec.: A = 40 ± 1 IRE

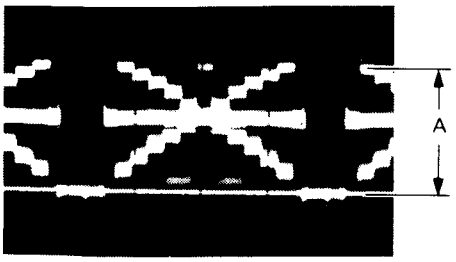


4-4-6. Video Gain Adjustment (YC-38 Board)

Subject: Grayscale chart
Equipment: Oscilloscope
Test point: TP2 (GND: Pin9/Extension board)/PR-122 board
Adjust:
1. Adj. point: Lens iris
   Spec.: A = 250 ± 10 mV

2. Preparation: Mount the YC-38 board to the MB-222 board.
   * Be sure to turn off the power before mounting the PC boards.
   Turn the SW1/YC-38 board and adjust the level of A as follows:

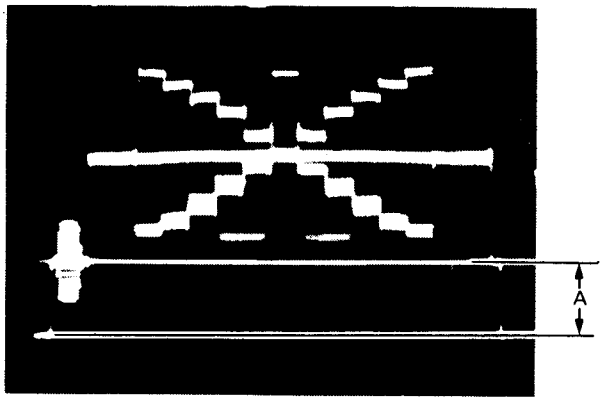
SW1 position	Adjustment point	Specification
"0" (AGC)	◐RV2/PR-122 board	A = 400 ± 20 mV
"1" (-6dB)	◐RV3/YC-38 board	A = 125 ± 10 mV
"2" (0dB)	◐RV4/YC-38 board	A = 250 ± 10 mV
"3" (+6dB)	◐RV5/YC-38 board	A = 500 ± 20 mV
"4" (+12dB)	◐RV6/YC-38 board	A = 1000 ± 40 mV

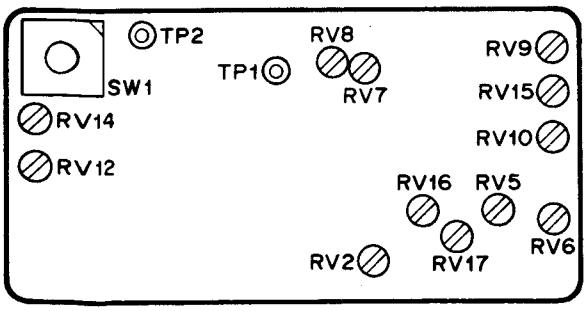


Adjust 1 and 2

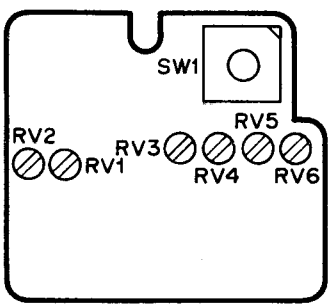
4-4-7. Y Gain Adjustment (YC-38 Board)

Preparation: SW1/YC-38 board .... "2"
Subject: Grayscale chart
Equipment: Waveform monitor
Test point: Cable CCXC-9DB, Y OUT
Adj.point: ◐RV1/YC-38 board
Spec.: A = 40 ± 1 IRE





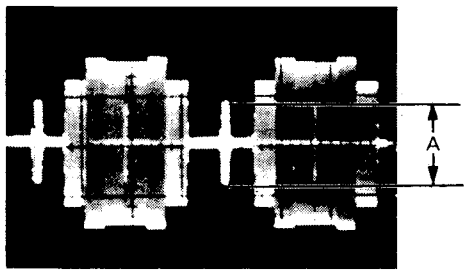
PR-122 BOARD (A SIDE)

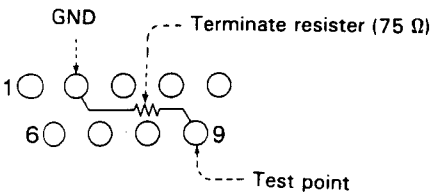


YC-38 BOARD (A SIDE)

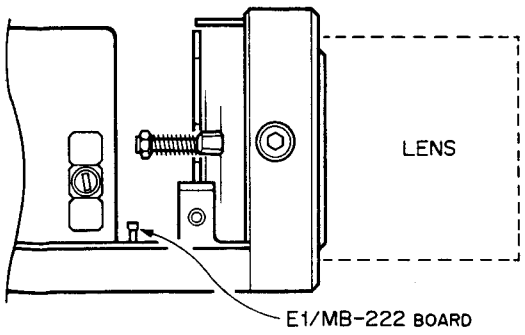
4-4-8. C Gain Adjustment (YC-38 board)

Preparation: SW1/PR-122 board .... "2"
Subject: Color-bar chart
Equipment: Oscilloscope (terminated 75 Ω)
Test point: DSUB connector, pin 9
(GND: E1/MB-222 board)
Adj. point: RV2/YC-38 board
Spec.: A = 286 ± 7 mV



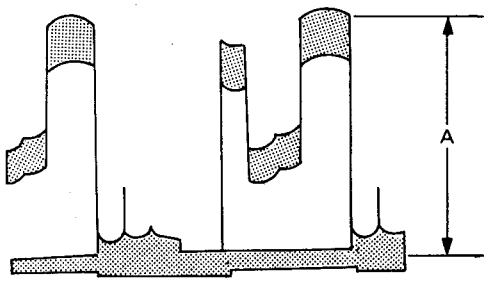


CN-295 board A side
(DSUB connector)

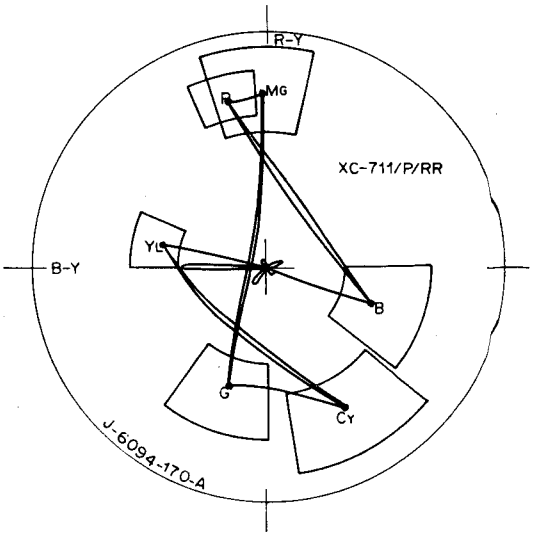


4-4-9. Hue Adjustment (PR-122 Board)

Preparation: SW1/PR-122 board .... "2"
Subject: Color-bar chart
Adjust:
1. Equipment: Oscilloscope
Test point: TP2 (GND: Pin 9/Extension board)/PR-122 board
Adj. point: Lens iris
Spec.: A = 400 ± 10 mV



2. Equipment: Vectorscope
Test point: Cable CCXC-9DB, VIDEO OUT
Adj. point 1: ◐RV7, ◐RV8/PR-122 board (alternately adjust)
Spec. 1: White signal spot is at the center of the vectorscope screen.
Adj. point 2: ◐RV5, ◐RV6, ◐RV10, ◐RV15/PR-122 board (alternately adjust)
Spec. 2: The bright spots of R and Y1 have to be inside the specified frame.



4-5. RGB SYSTEM

Preparation:
1. Take the YC-38 board and EN-72 board off the MB-222 board.
2. ◐RV2, ◐RV4, ◐RV7, ◐RV10/RD-14 board
   .... All clockwise full
* Be sure to turn off the power before mounting the PC board.

4-5-1. Setup Level Adjustment (RD-14 Board)

Lens iris: Closed "C"
Equipment: Waveform monitor (EXT SYNC mode)
Adjust:
1. Test point: Cable CCXC-9DB, R OUT
   Adj. point: ◐RV5/RD-14 board
   Spec.: A = 7.5 ± 1 IRE

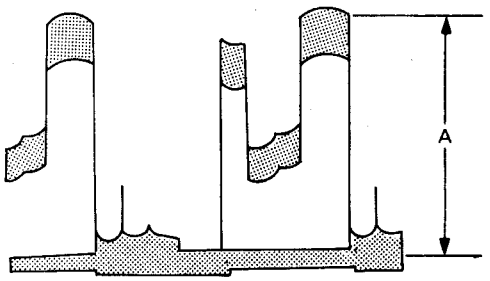
2. Test point: Cable CCXC-9DB, G OUT
   Adj. point: ◐RV8/RD-14 board
   Spec.: A = 7.5 ± 1 IRE

3. Test point: Cable CCXC-9DB, B OUT
   Adj. point: ◐RV11/RD-14 board
   Spec.: A = 7.5 ± 1 IRE

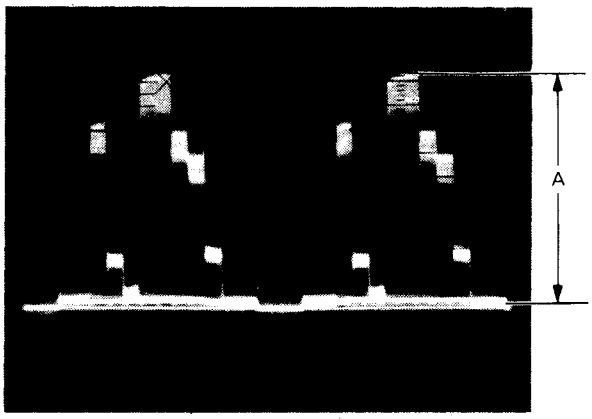
Adjust 1 to 3

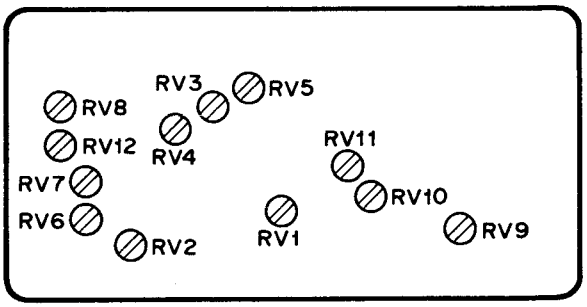
4-5-2. RGB Level Adjustment (RD-14 Board)

Subject: Color-bar chart
Adjust:
1. Equipment: Oscilloscope
   Test point: TP2 (GND: Pin 9/Extension board)/PR-122 board
   Adj. point: Lens iris
   Spec.: A = 400 ± 10 mV



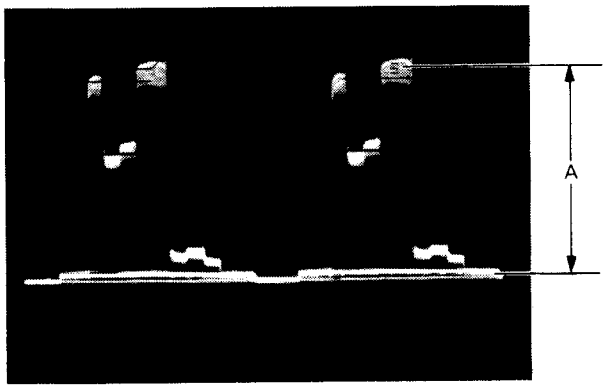
2. Equipment: Waveform monitor
   Test point: Cable CCXC-9DB, R OUT
   Adj. point: ◐RV3/RD-14 board
   Spec.: A = 100 ± 2 IRE



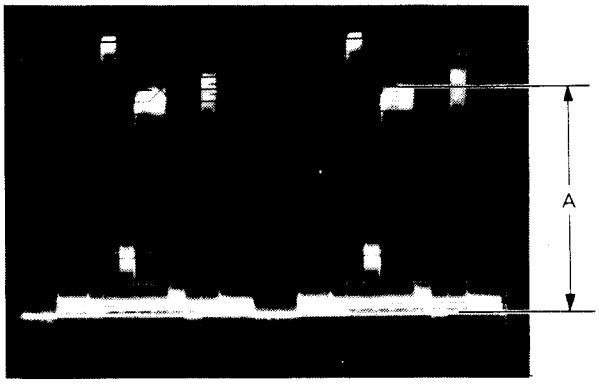


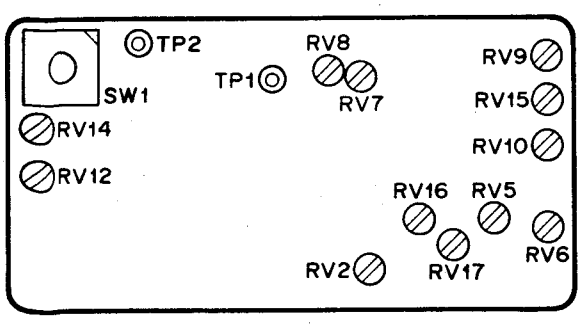
RD-14 BOARD (A SIDE)

3. Equipment: Waveform monitor
Test point: Cable CCXC-9DB, G OUT
Adj. point: ◐RV6/RD-14 board
Spec.: A = 100 ± 2 IRE



4. Equipment: Waveform monitor
Test point: Cable CCXC-9DB, B OUT
Adj. point: ◐RV9/RD-14 board
Spec.: A = 100 ± 2 IRE



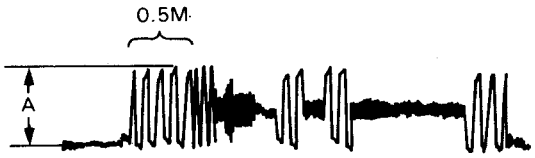


PR-122 BOARD (A SIDE)

4-5-3. Aperture Adjustment (RD-14/PR-122 Boards)

Subject: Inmega chart
Equipment: Waveform monitor (15 LINE mode)
Test point: Cable CCXC-9DB, G OUT
Adjust:

1. Adj. point: Lens iris
Spec.: 0.5 MHz level A = 40 ± 2 IRE

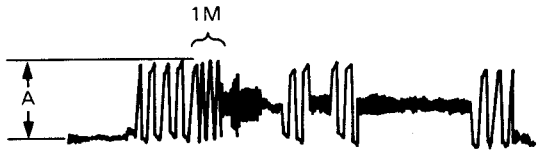


2. Preparation: ◐RV2/RD-14 board
.... counterclockwise full
Adj. point: ◐RV1/RD-14 board
Spec.: 1 MHz level A = 80 ± 2 IRE

3. Adj. point: ◐RV2/RD-14 board
Spec.: 1 MHz level A = 45 ± 2 IRE

4. Adj. point: ◐RV1/RD-14 board
Spec.: 1 MHz level A = 57 ± 2 IRE

5. Adj. point: ◐RV9/PR-122 board
Spec.: 1 MHz level A = 55 ± 2 IRE



Adjust 2 to 5

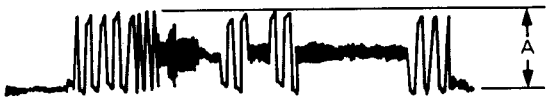
4-5-4. White Clip Adjustment (RD-14 Board)

Subject: Inmega chart
Lens iris: Open
Equipment: Waveform monitor
Adjust:

1. Test point: Cable CCXC-9DB, G OUT
   Adj. point: ◐RV7/RD-14 board
   Spec.: A = 110 ± 2 IRE

2. Test point: Cable CCXC-9DB, R OUT
   Adj. point: ◐RV4/RD-14 board
   Spec.: A = 110 ± 2 IRE

3. Test point: Cable CCXC-9DB, B OUT
   Adj. point: ◐RV10/RD-14 board
   Spec.: A = 110 ± 2 IRE



Adjust 1 to 3

4-6. VBS SYSTEM

Preparation:

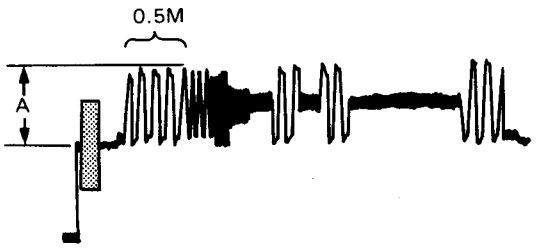
1. Remove the solder of the "C-OUT" pattern jumper of the EN-72 board that had been removed, and open it.
2. Mount the EN-72 board and the YC-38 board to the MB-222 board.
3. Insert the shield board that had been removed, between the EN-72 board and the RD-14 board.

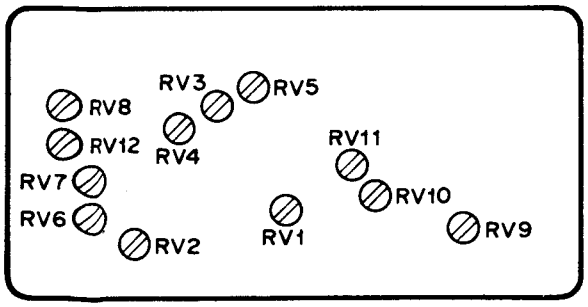
* Be sure to turn off the power before mounting the PC boards.

4-6-1. Aperture Adjustment (EN-72/PR-122 Boards)

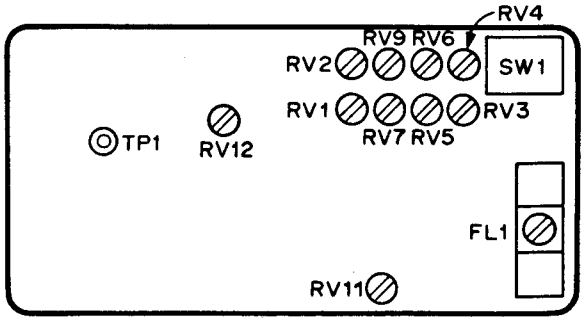
Subject: Inmega chart
Equipment: Waveform monitor
Test point: Cable CCXC-9DB, VIDEO OUT
Adjust:

1. Adj. point: Lens iris
   Spec.: 0.5 MHz level A = 50 ± 2 IRE





RD-14 BOARD (A SIDE)



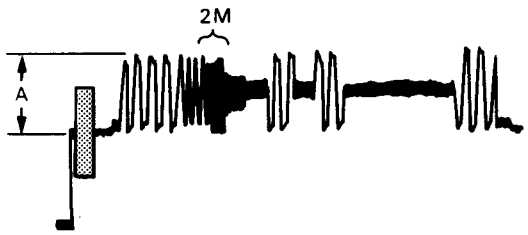
EN-72 BOARD (B SIDE)

2. Preparation: ◐RV4/EN-72 board
.... counterclockwise full
Adj. point: ◐RV3/EN-72 board
Spec.: 2 MHz level A = 80 ± 2 IRE

3. Adj. point: ◐RV4/EN-72 board
Spec.: 2 MHz level A = 50 ± 2 IRE

4. Adj. point: ◐RV3/EN-72 board
Spec.: 2 MHz level A = 57 ± 2 IRE

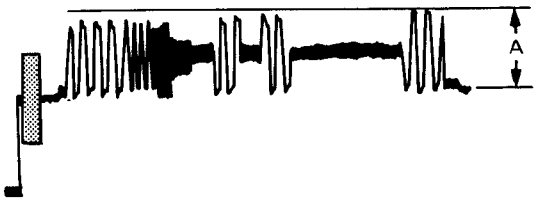
5. Adj. point: ◐RV16/PR-122 board
Spec.: 2 MHz level A = 55 ± 2 IRE

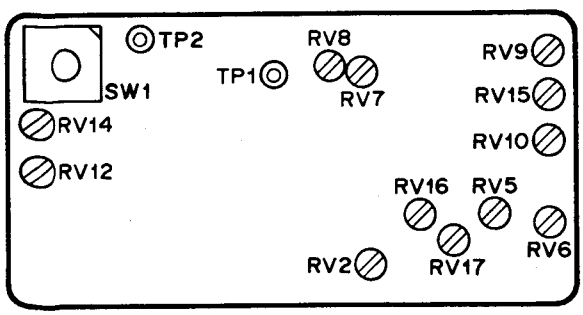


Adjust 2 to 5

4-6-2. White Clip Adjustment (EN-72 Board)'

Subject: Inmega chart
Lens iris: Open
Equipment: Waveform monitor
Test point: Cable CCXC-9DB, VIDEO OUT
Adj. point: ◐RV5/EN-72 board
Spec.: A = 110 ± 2 IRE



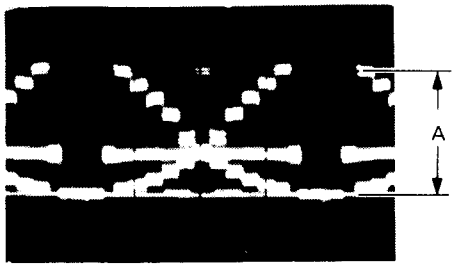


PR-122 BOARD (A SIDE)

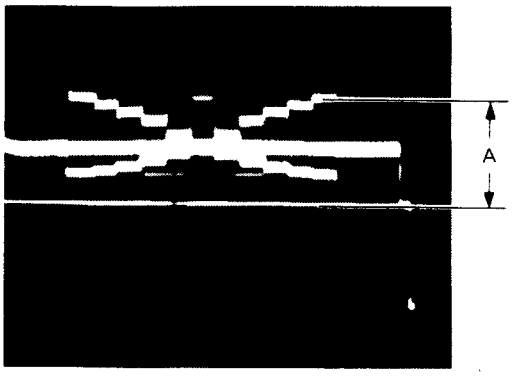
4-6-3. Chroma Level Adjustment (EN-72 Board)

Subject: Grayscale chart
Adjust:

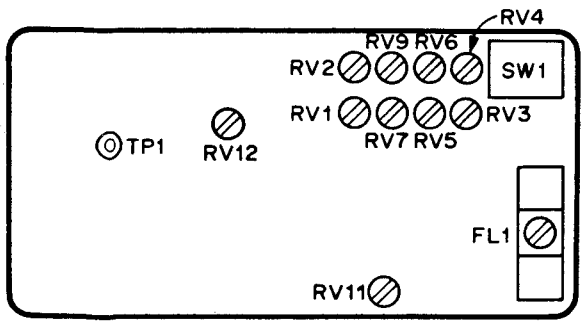
1. Equipment: Waveform monitor
   Test point: Cable CCXC-9DB, G OUT
   Adj. point: Lens iris
   Spec.: A = 100 ± 2 IRE



2. Preparation: SW1/PR-122 board .... "A"
   Equipment: Waveform monitor
   Test point: Cable CCXC-9DB, G OUT
   Adj. point: ◐ RV9/EN-72 board
   Spec.: A = 100 ± 5 IRE



3. Confirmation: Turn the SW1-1/EN-72 board to "ON"/ "OFF" and confirm that the level of A is not changes.

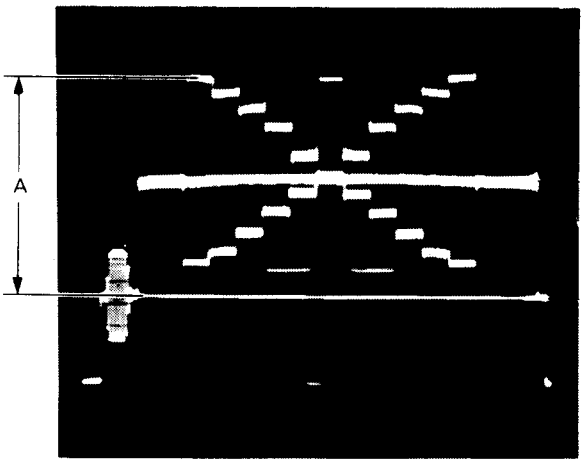


EN-72 BOARD (B SIDE)

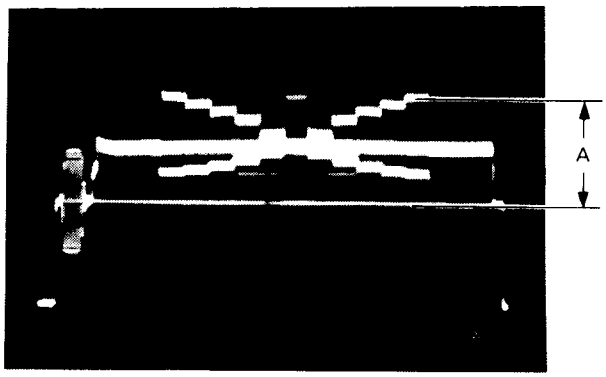
4-6-4. VBS Level Adjustment (EN-72 Board)

Subject: Grayscale chart
Adjust:

1. Preparation: SW1-1/EN-72 board .... "ON"
   Equipment: Waveform monitor
   Test point: Cable CCXC-9DB, VIDEO OUT
   Adj. point: Lens iris
   Spec.: A = 100 ± 2 IRE



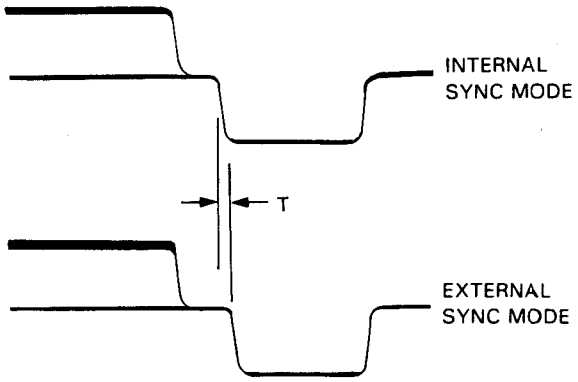
2. Preparation: SW1-1/EN-72 board .... "OFF"
   Equipment: Waveform monitor
   Test point: Cable CCXC-9DB, VIDEO OUT
   Adj. point: ◐RV2/EN-72 board
   Spec.: A = 100 ± 5 IRE



3. Confirmation: Turn the SW1-1/EN-72 board to "ON" and confirm that the level of A is not changes.

4-6-5. SYNC Phase Adjustment (EN-72 board)

Subject: Grayscale monitor
Equipment: Waveform monitor (Measuring is performed by switching the waveform monitor between internal and external SYNC signals.)
Test point: Cable CCXC-9D, VIDEO OUT
Adj. point: ◐RV12/EN-72 board
Spec.: T ≦ 100 ns



4-7. WHITE BALANCE SYSTEM (MD-61 Board)

Preparation:

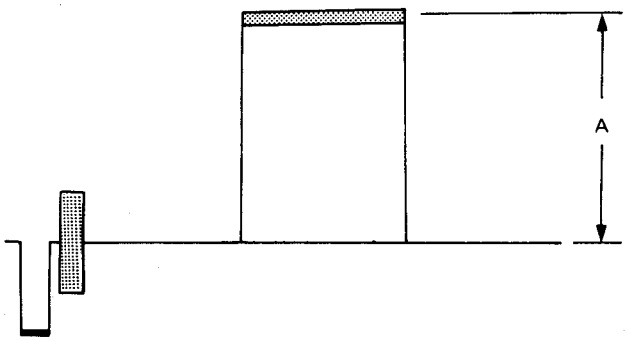
1. Remove the PC boards from the MB-222 board in the following order: DR-83 board, TG-48 board, PR-122 board and extension board.
2. Remount the PR-122 board to the MB-222 board.
3. Remount the TG-48 board to the MB-222 board, pulling the harness of the PR-122 board toward the front so that it is not pressed under the PC board.
4. Remount the DR-83 board to the MB-222 board.

* Be sure to turn off the power before removing and remounting the PC boards.

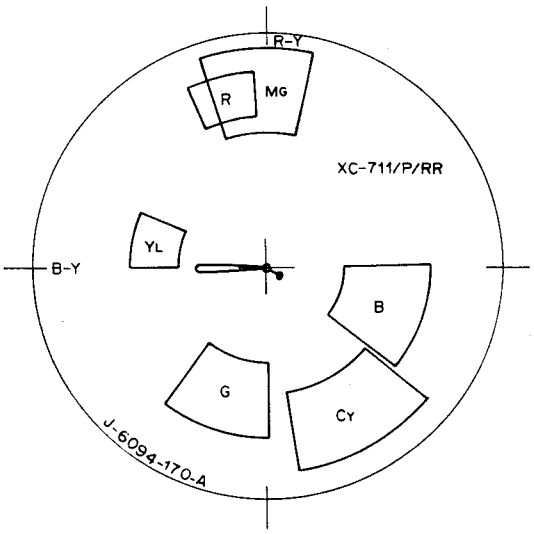
4-7-1. Color Temperature Adjustment (5600°K)

Subject: White window chart
Preparation: Cover the lens with a LB140 filter
SW1-1/EN-72 board .... "ON"
SW1-2/EN-72 board .... "OFF"
SW1-3/EN-72 board .... "ON"
Adjust:

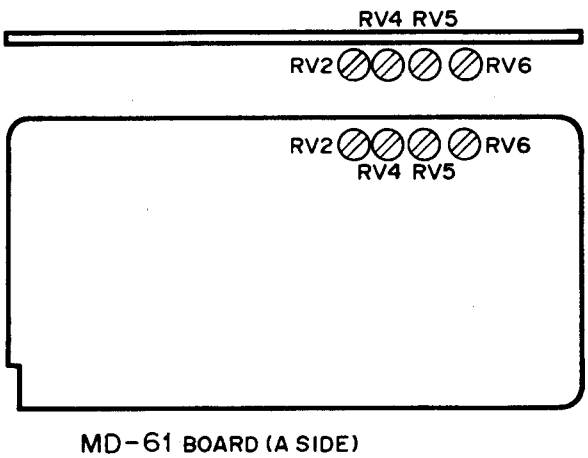
1. Equipment: Waveform monitor
   Test point: Cable CCXC-9DB, VIDEO OUT
   Adj. point: Lens iris
   Spec.: A = 90 ± 3 IRE



2. Equipment: Vectorscope
   Test point: Cable CCXC-9DB, VIDEO OUT
   Adj. point: ◐RV5, ◐RV6/MD-61 board (alternately adjust)
   Spec.: The bright spot is at the center of the vectorscope screen.



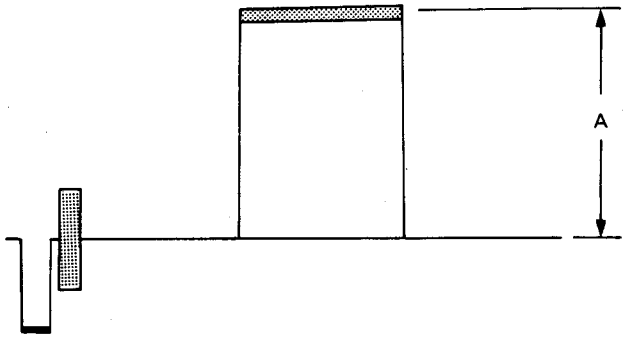
NOTE: Remove the LB140 filter from the lens after adjustment.



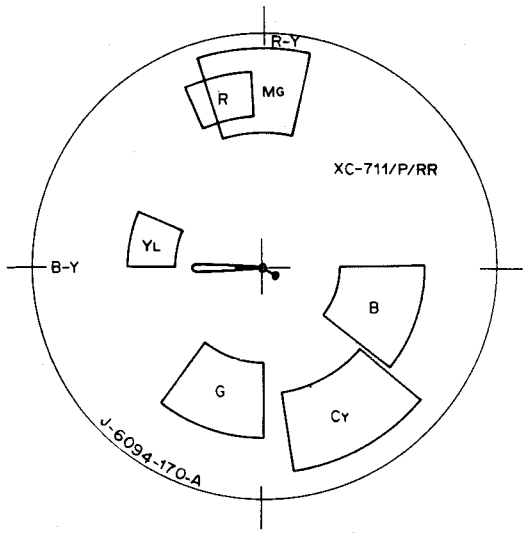
MD-61 BOARD (A SIDE)

4-7-2. Auto White Balance Offset Adjustment

Subject: White window chart
Preparation: SW1-2/EN-72 board .... "ON"
Adjust:
1. Equipment: Waveform monitor
   Test point: Cable CCXC-9DB, VIDEO OUT
   Adj. point: Lens iris
   Spec.: A = 50 ± 2 IRE

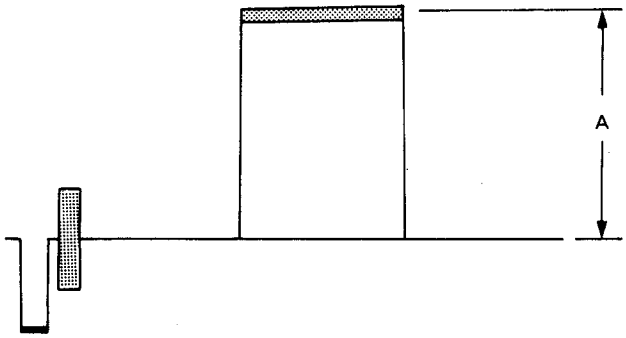


2. Equipment: Vectorscope
   Test point: Cable CCXC-9DB, VIDEO OUT
   Adj. point: ◐RV2, ◐RV4/MD-61 board (alternately adjust)
   Spec.: The bright spot is at the center of the vectorscope screen.

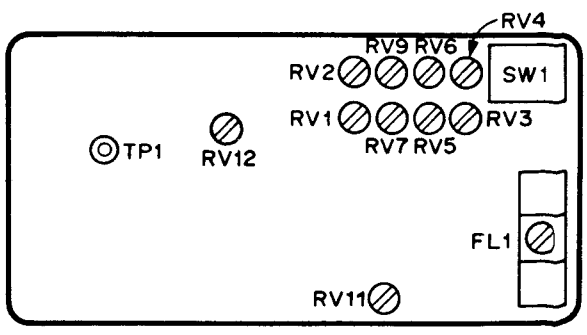


4-7-3. Auto White Balance Mode Check

Subject: White window chart
Preparation:
1. SW1-2/EN-72 board .... "OFF"
2. Cover the lens with a LB200 filter
Adjust: Equipment: Waveform monitor
   Test point: Cable CCXC-9DB, VIDEO OUT
   Adj. point: Lens iris
   Spec.: A = 50 ± 2 IRE



Configuration: Equipment: Vectorscope
   Test point: Cable CCXC-9DB, VIDEO OUT
   Config. point: Bright spot position.
   Spec.: When the SW1-2/EN-72 board is set to ON, the bright spot moves to the center of the vectorscope screen.

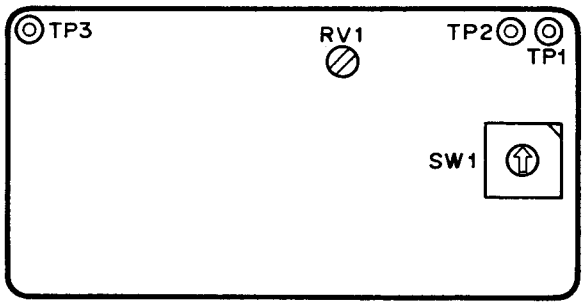


EN-72 BOARD (B SIDE)

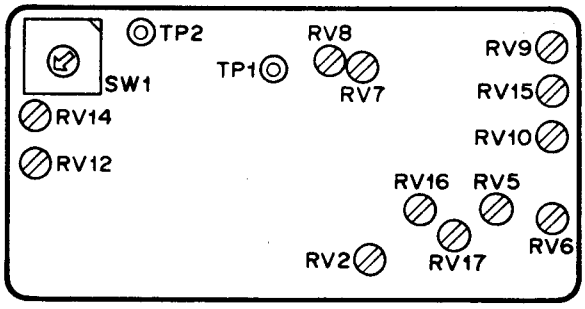
4-8. SWITCH SETTING

The switches are factory-set as follows.

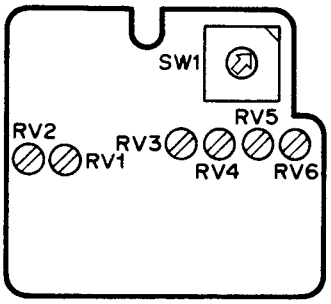
- DR-83 board, SW1 ....."0"
- PR-122 board, SW1 ..."A"
- YC-38 board, SW1 ....."2"
- EN-72 board, SW1-1 .."ON"
  -2 .."OFF"
  -3 .."OFF"
  -4 .."OFF"



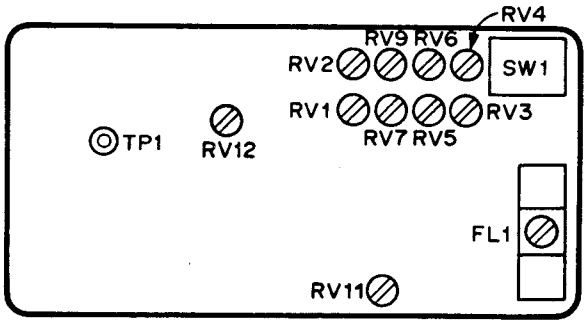
DR-83 BOARD (B SIDE)



PR-122 BOARD (A SIDE)



YC-38 BOARD (A SIDE)



EN-72 BOARD (B SIDE)

SECTION 2
COMPREHENSIVE SPECIFICATIONS

2-1. SPECIFICATIONS

<CAMERA MODULE XC-711P>

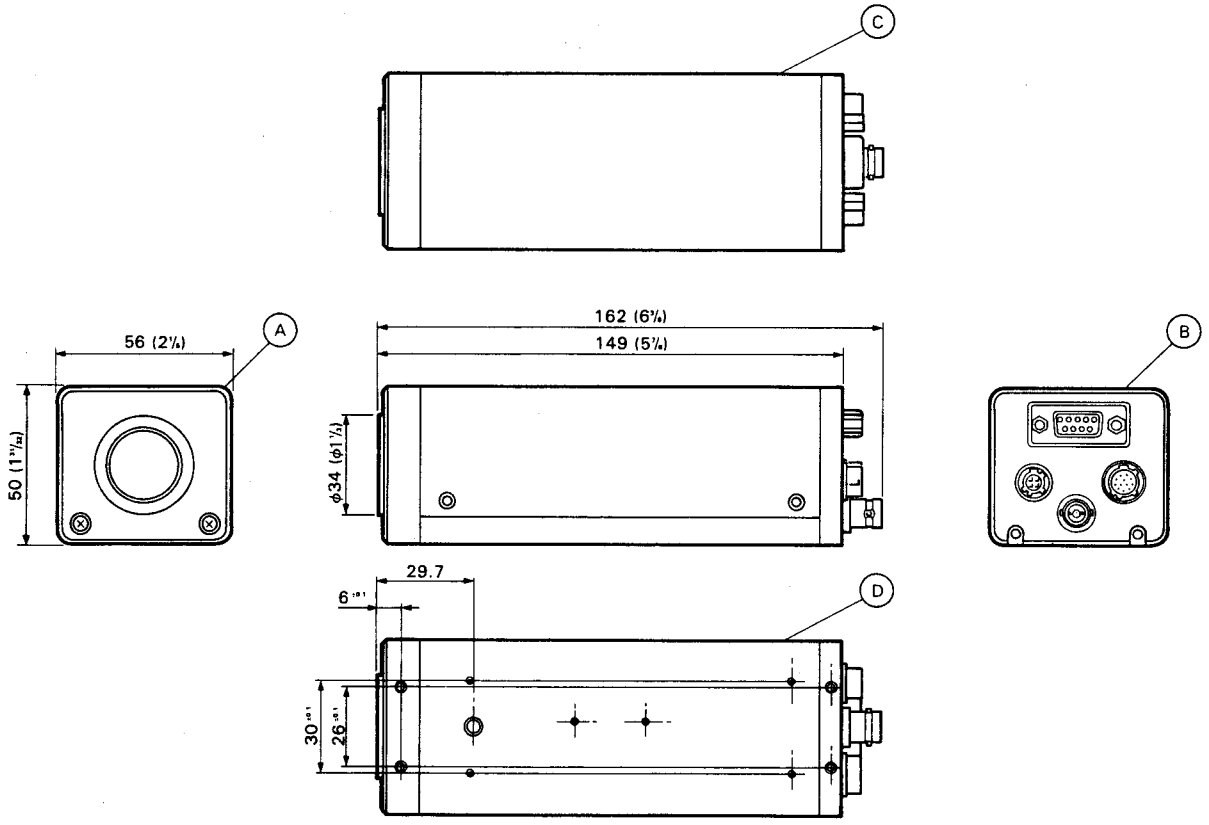
Pickup Device	Interline transfer CCD
Picture elements	756 (H) x 581 (V)
Sensing area	8.8 mm x 6.6 mm (the same as the 2/3-inch camera tube)
Optical black	60 pixels each horizontal line
Vertical drive frequency	15.625 kHz
Horizontal drive frequency	14.1875 MHz
Signal system	CCIR standard
Cell size	11 μm (H) x 11 μm (V)
Chip size	10.0 mm (H) x 8.2 mm (V)
Optical System	
Lens mount	C mount
Frange back length	17.526 mm
Sync System	Internal/External automatic change
External sync input	S/VBS/VS (sync level: 0.3 Vp-p ± 6 dB) HD and VD (HD, VD level: 2 to 5 Vp-p)
External sync frequency tolerance	± 1%
Jitter	Within ± 100 n sec
Locking time when power is on.	Within 10 sec
Scanning System	2 : 1 Interface; 625 lines
Video Output	VBS (1.0 Vp-p sync negative, 75 ohms unbalanced.) RGB (0.7 Vp-p)
Horizontal Resolution	330 TV lines
Vertical Effective lines	2 : 1 Interlace; 575 lines
Sensitivity	2000 Luxes with F4 (γ ON/0 dB)
Minimum Illumination	25 Luxes, F1.4, + 12 dB
S/N ratio	48 dB
Power Requirement (Tolerance)	DC 12 V (10.5 V to 15 V)
Power Consumption	5.5 W
Weight	
Camera module	380 g (XC-711P)
Junction box	170 g (JB-77)
Storage Temperature	−20°C to +50°C
Operating Temperature	0°C to 40°C
Shock resistance	70 G
Storage Humidity	Within 90%
Operating Humidity	Within 70%

<STANDARD LENS VCL-16Y-M>

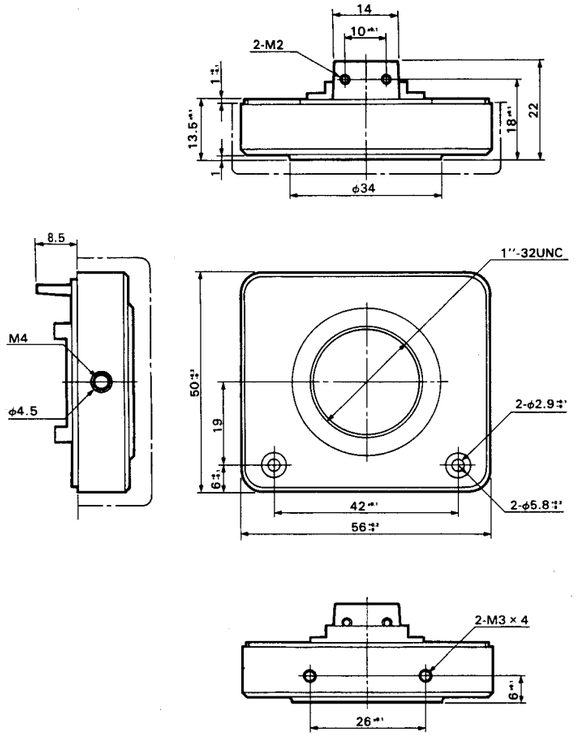
Focal Length	16 mm
Maximum Aperture Ratio	1 : 1.4
Iris Control	F1.4 to F16
Filter Thread	M 25.5 mm x P 0.5 mm
Mount	C mount
Weight	50 g

Dimensions:

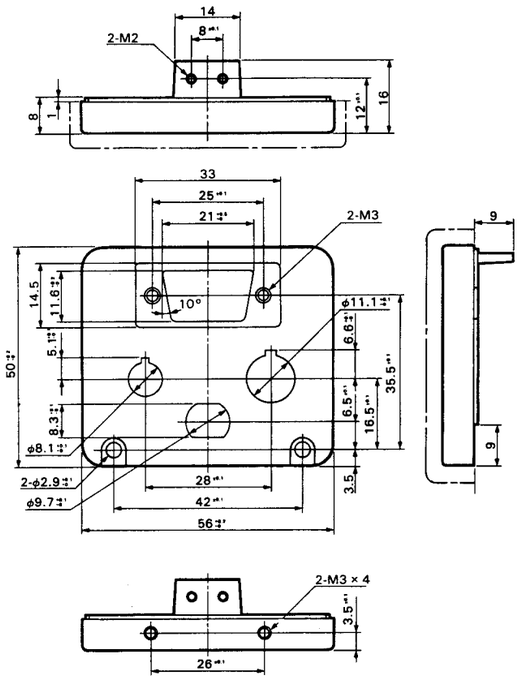
Camera Module <XC-711P>



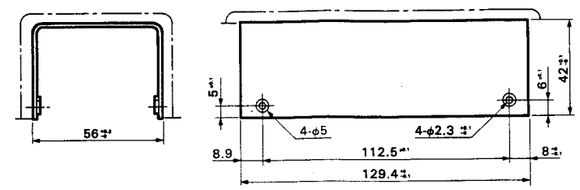
Ⓐ


14
10
2-M2
1
13.5
18
22
ϕ34
8.5
M4
ϕ4.5
1"-32UNC
50
19
6
2-ϕ2.9
42
56
2-ϕ5.8
2-M3 × 4
6
26

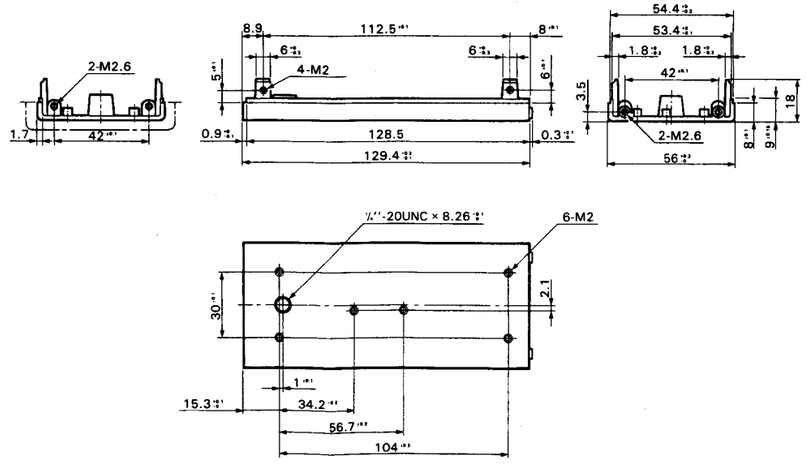
Ⓑ


14
8
2-M2
8
1
12
16
33
25
21
2-M3
9
14.5
11.6
5
10°
ϕ11.1
6.6
50
35.5
6.5
16.5
8.3
ϕ8.1
9
2-ϕ2.9
ϕ9.7
28
42
56
3.5
2-M3 × 4
3.5
26

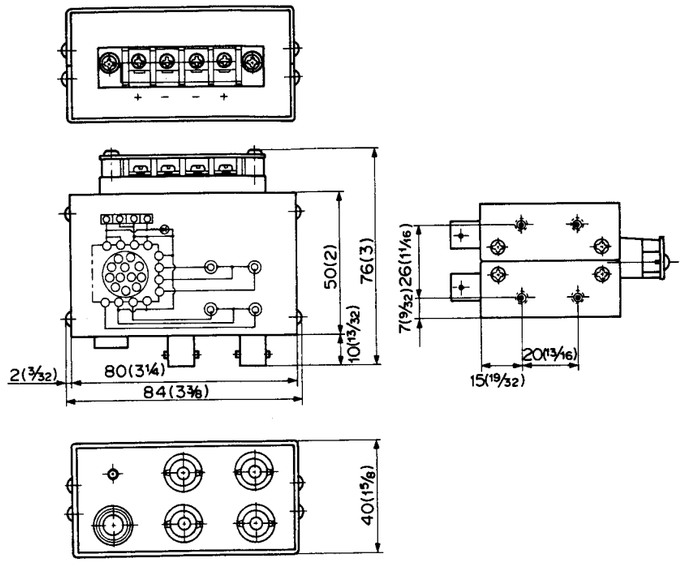
Ⓒ


56
5
4-ϕ5
4-ϕ2.3
42
6
8.9
112.5
8
129.4

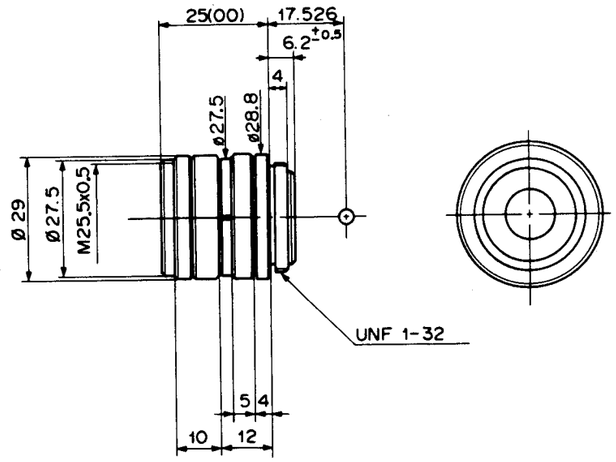
Ⓓ


2-M2.6
1.7
42
8.9
112.5
8
6
6
4-M2
5
6
0.9
128.5
0.3
129.4
54.4
53.4
1.8
1.8
42
3.5
18
2-M2.6
8
9
56
1/4"-20UNC × 8.26
6-M2
30
2.1
1
15.3
34.2
56.7
104

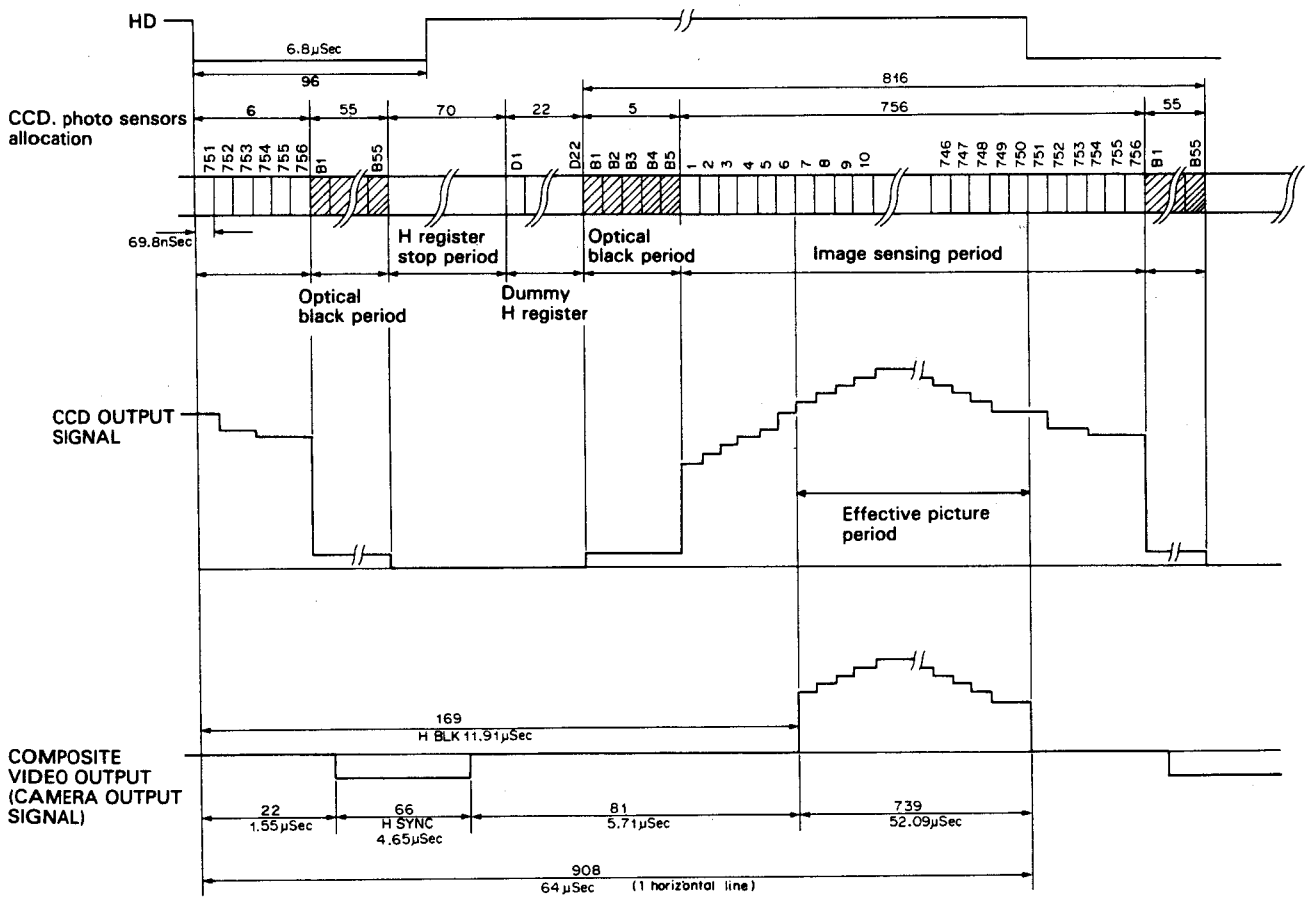
Junction box <JB-77>



Lens <VCL-16Y-M>



2-2. OUTPUT SIGNAL TIMING CHART



2-3. EXTERNAL SYNCHRONIZATION

There are three external synchronization modes:
1. S/VS/VBS mode
2. HD and VD mode
3. RESTART RESET mode

2-3-1. S/VS/VBS Mode

The S/VS/VBS mode provides external synchronization by supplying a normal composite signal, S, VS or VBS, to pin 7 of the 12-pin connector.

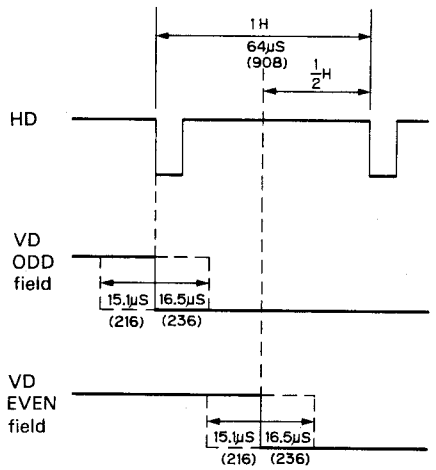
2-3-2. HD and VD Mode

The HD and VD mode provides external synchronization by supplying an HD signal to pin 6 and a VD signal to pin 7 of the 12-pin connector.

• Input conditions of HD and VD signals

• Frequency (period)
HD: 15.625 KHz ± 1% (64 μs ± 1%)
VD: 293 1/2 H to 1023 1/2 H
*The maximum number of vertical effective lines is 581 in the interlace mode.
In the non-interlace mode, it is 290 for both the ODD field and the EVEN field.

• Phase



The figure in parentheses ( ) indicates the number of clock pulses

As shown in the illustration above, the ODD field is provided when the phase shift between the trailing edge of the VD signal and the trailing edge of the HD signal is between a lead of 15.1 μs and a lag of 16.5 μs. The EVEN field is provided when the phase shift between the trailing edge of the VD signal and the point 1/2H from the trailing edge of the HD signal is between a lead of 15.1 μs and a lag of 16.5 μs.

• Interlace and non-interlace

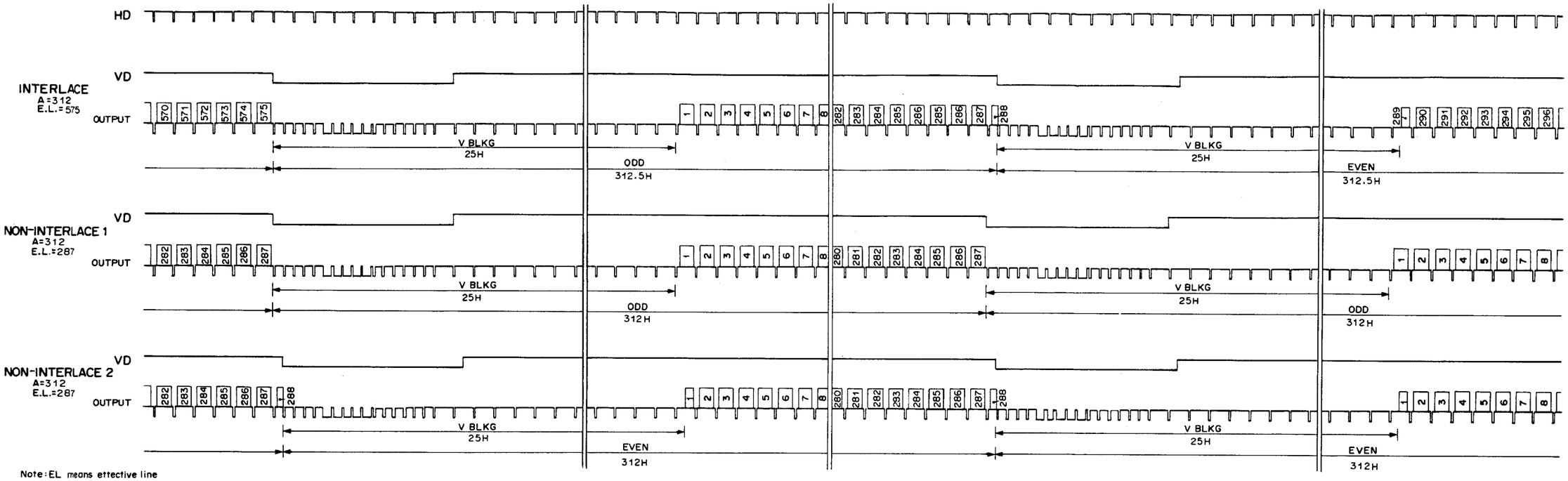
Operation can be performed in either interlace or non-interlace mode by changing the input condition of the VD signal. See Figure 1.

• Interlace

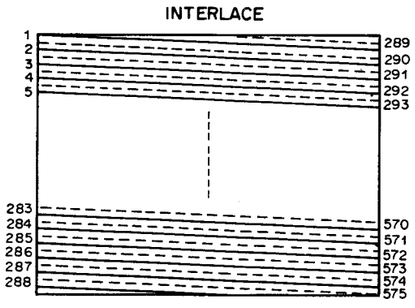
To operate in the interlace mode, set the period of the VD signal to (A + 1/2) H.A is an integer, 293 to 1023. In other words, the phase of the leading edge of the VD signal against the leading edge of the HD signal is changed for each VD signal. The field changes from ODD to EVEN and to ODD, repeatedly during operation in the interlace mode. At this time, the number of scanning lines per frams is 2A + 1.

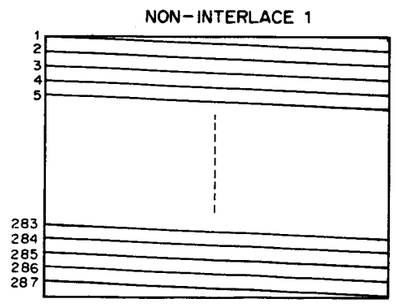
• Non-interlace

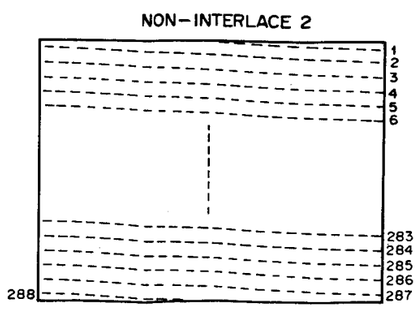
To operate in the non-interlace mode, set the period of the VD signal to A H. A is an integer, 293 to 1023. In other words, the phase of the leading edge of the VD signal against the leading edge of the HD signal is not changed for each VD signal, and the field ODD or EVEN remains unchanged for operation in the non-interlace mode. The number of scanning lines is A; this is half of the number of scanning lines for operation in the interlace mode. The sensitivity is half of the sensitivity provided in the interlace mode, when the frame is stored. See Figure 2.



Note: EL means effective line

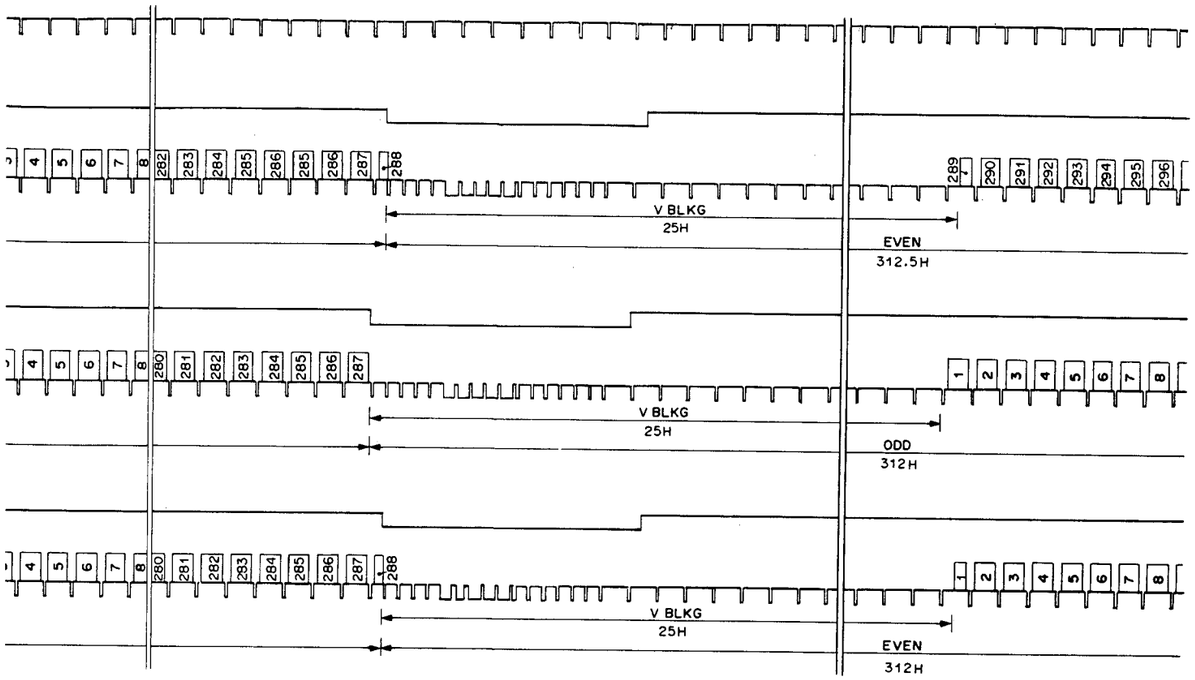




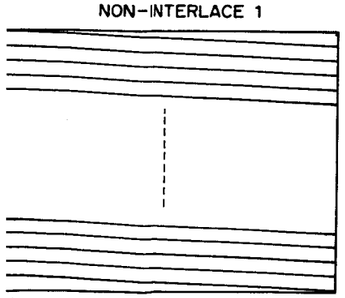


[Fig. 1]

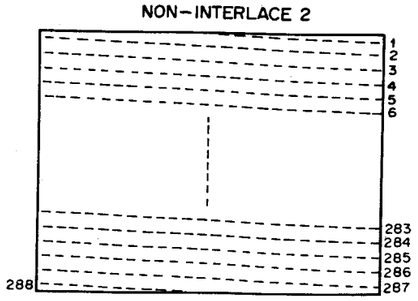
Read out mode settin	
Scanning mode	
Scanning	NORMAL MODE
	INVERSE MODE
Storage time and VIDEO OUT correlati	
Vertical effective lin (TV lines)	
RESTART RESET	
Features and application	



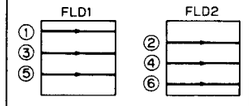
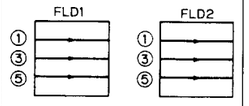
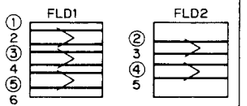
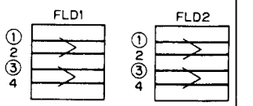
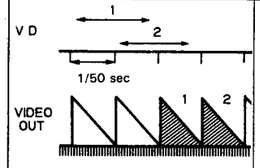
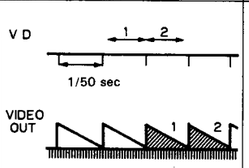
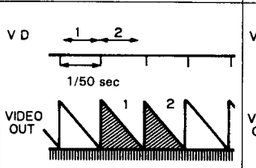
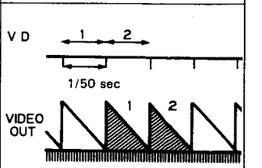
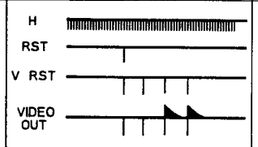
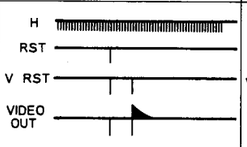
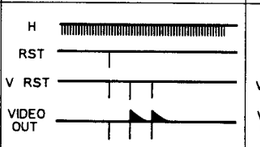
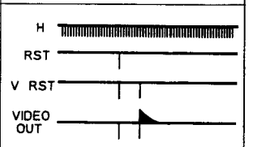
NON-INTERLACE 1



NON-INTERLACE 2

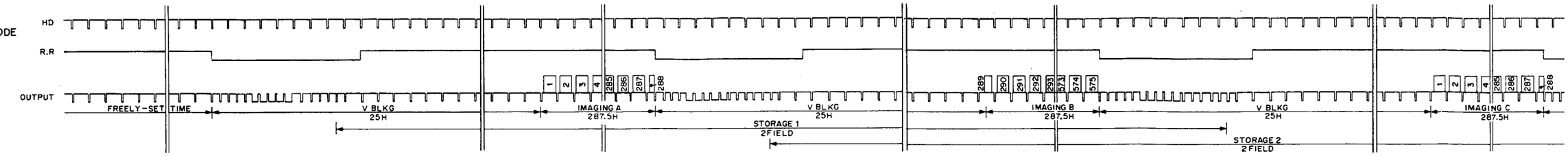


[Fig. 1]

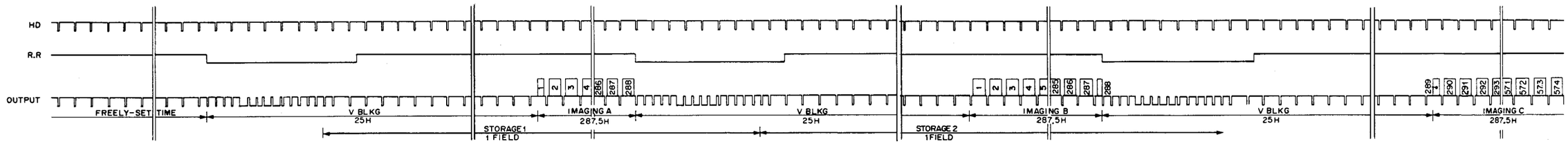
Read out mode setting	Frame integration mode (XC-711P initial setting)		Field integration mode	
Scanning mode	Interlace	Non-interlace	Interlace	Non-interlace
Scanning — NORMAL MODE				
Scanning — INVERSE MODE	FLD 1 and FLD 2 are inverted.	FLD 1 and FLD 2 become ②, ④, ⑥....	FLD 1 and FLD 2 are inverted.	FLD 1 and FLD 2 become ②, ④, ⑥....
Storage time and VIDEO OUT correlation				
Vertical effective lines (TV lines)	575	287	415	287
RESTART RESET				
Features and application	As the highest possible resolution is obtained, it is adapted to the measurements of the frame memory.	Operates per 1 vertical line. Note: The operation is field integration mode.	Due to the storage of 1/50 seconds, a picture with even less disturbances than the frame integration mode is obtained. Adapted to pick up a moving object.	This system obtains all the vertical information without decreasing the sensitivity in non-interlace mode.

[Fig. 2] Relation between scanning mode and integration mode

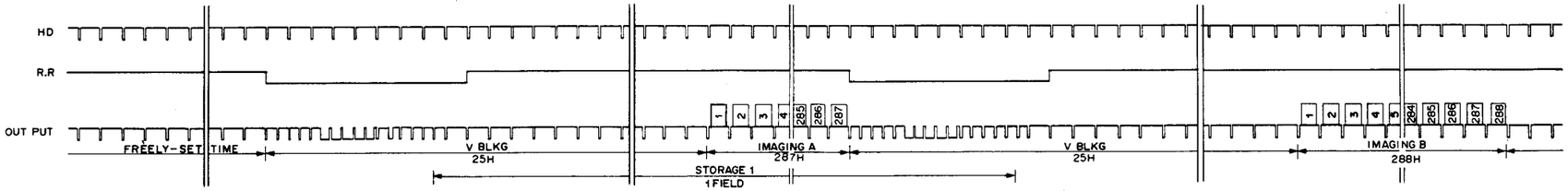
FRAME INTEGRATION MODE
INTERLACE
A=312
E.L=575



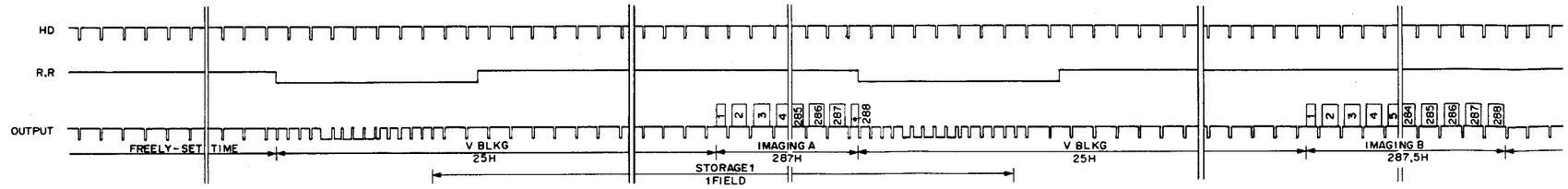
FIELD INTEGRATION MODE
INTERLACE
A=312
E.L=287



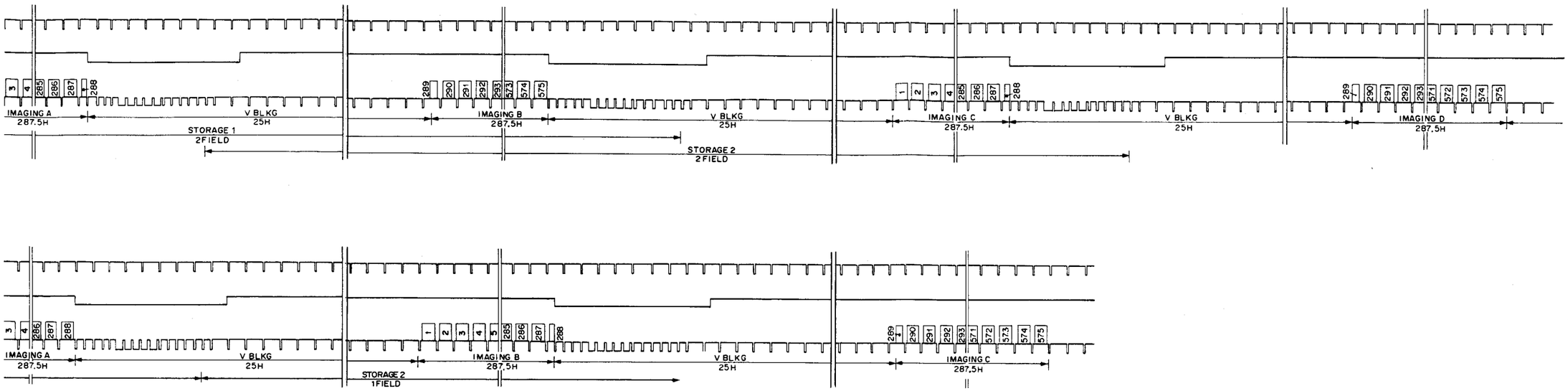
NON-INTERLACE 1
A=312
E.L=287



NON-
A=312
E.L=287



[Fig. 3]


IMAGING A
287.5H
V BLKG
25H
STORAGE 1
2FIELD
IMAGING B
287.5H
V BLKG
25H
STORAGE 2
2FIELD
IMAGING C
287.5H
V BLKG
25H
IMAGING D
287.5H
IMAGING A
287.5H
V BLKG
25H
STORAGE 2
1FIELD
IMAGING B
287.5H
V BLKG
25H
IMAGING C
287.5H
IMAGING A
287H
V BLKG
25H
IMAGING B
288H
IMAGING A
287H
V BLKG
25H
IMAGING B
287.5H

[Fig. 3]

2-3-3. RESTART RESET Mode

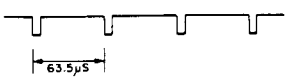
In the RESTART RESET (R.R) mode, information for one screen can be retrieved at any time. It is necessary to internally set the R.R mode in the camera to provide the R.R mode. See Section 2-4 "OPERATION MODE SETTING". Supply the HD and R.R signals to pin 6 and pin 7 of the 12-pin connector to obtain output.

• Input conditions for the HD and R.R signals

• Frequency (period)

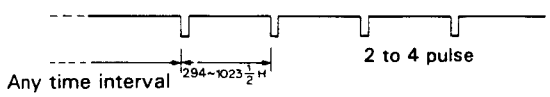
HD signal: 15.625 KHz ± 1% (64 μs ± 1%)

Continuous pulse



R.R signal: 294 to 1023 1/2 H

2 to 4 pulses depending on the mode

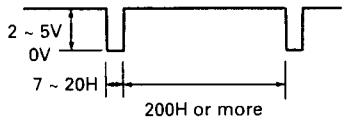


• Phase

The same phase conditions as for the HD and VD mode are applied to this mode. See Section 2-3-2.

Note

To operate after the power is just turn on, be sure to feed the two reset pulses as shown below to pin 7 of the 12-pin connector.



• Explanation of the timing chart

Figure 3 is the timing charts for each operation mode. The details of these timing charts are given below:

• Frame integration interlace mode

The R.R requires four pulses. Set the period of the R.R to (A + 1/2) H. A is an integer, 294 to 1023. It is 312 in the figure.

Shooting information during STORAGE 1 and STORAGE 2 is output in the intervals of IMAGING C (ODD) and IMAGING D (EVEN). The CCD is reset in the intervals of IMAGING A and IMAGING B. Therefore, signals output during these intervals are meaningless.

• Field integration interlace mode

The R.R requires three pulses. Set the period of the R.R to (A + 1/2) H. A is an integer, 294 to 1023. It is 312 in the figure.

Shooting information during STORAGE 1 and STORAGE 2 is output in the intervals of IMAGING B (ODD) and IMAGING C (EVEN). The CCD is reset in the interval of IMAGING A; therefore, signals output during this interval are irrelevant.

• Non-interlace mode

The R.R requires two pulses regardless of the storage mode. Set the period of the R.R to A H. A is an integer, 294 to 1023. It is 312 in the figure.

Shooting information in STORAGE 1 is output in the interval of IMAGING B. The CCD is reset in the interval of IMAGING A; therefore, signals output during this period are irrelevant.

2-4. OPERATION MODE SETTING

The XC-711P can switch the operation mode, depending on the use.

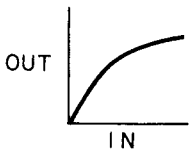
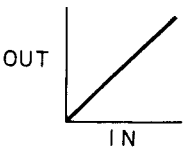
No.	Item	Board Name	Means
1	Gamma compensation mode	EN-72	Switch
2	White balance mode		
3	Y/C separation mode		Jumper
4	Chroma OFF mode*		
5	Gain mode	YC-38	Switch
6	G ON SYNC mode	RD-14	Jumper
7	SYNC output level		
8	Hue preset mode	PR-122	
9	Electronic Shutter mode	DR-83	Switch and jumper
10	Integration mode	TG-48	Jumper
11	Field inversion mode*		
12	Restart reset mode*	MB-222	
13	Synchronization mode		

* Chroma OFF mode, field inversion mode and restart reset mode can only be set in external synchronization mode.

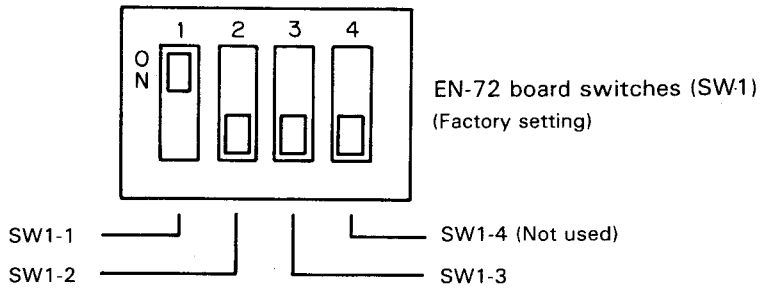
• Explanation of all operation modes

1. Gamma compensation mode (γ ON/γ OFF)
Set the gamma compensation of the RGB and VBS output signals by this mode. When the gamma compensation is set to ON, RGB and VBS signals for which gamma compensation is performed are output.
When it is set to OFF, no gamma compensation is performed for RGB and VBS signals. This setting provides RGB signals proportional to the amount of light from the object. The VBS output signal does not contain the chroma component when the gamma compensation is set to OFF. It is therefore a signal with only the luminance component.
The setting is performed with the DIP switch (SW1-1) on the EN-72 board. When this switch is set to ON, gamma compensation is ON. When it is set to OFF, gamma compensation is OFF. The factory setting is gamma ON.

2. White balance mode (AUTO/PRESET)
Set the colour temperature for the white balance adjustment.
When the white balance is set to AUTO, the white balance is adjusted automatically depending on the colour temperature of the object. If it is set to PRESET, the white balance is adjusted according to a preset colour temperature of 3200°K or 5600°K.
The setting of AUTO/PRESET is performed with the DIP switch (SW1-2) on the EN-72 board. When SW1-2 is set to ON, the mode is AUTO. When it is set to OFF, the mode is PRESET. And the setting of 3200°K/5600°K is performed with the DIP switch (SW1-3) on the same board. When SW1-3 is set to ON, 5600°K is preset. When it is set to OFF, 3200°K is preset. The factory settings are PRESET and 3200°K.
The colour temperature of "5600°K" in PRESET is adjusted at the factory to comply with 5600°K. However, it is possible to change it with RV5 and RV6 of the MD-61 board.

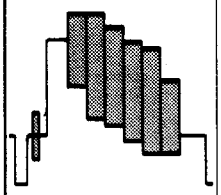
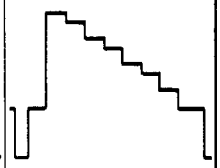
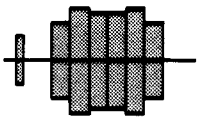
SW1-1	Mode	Input/Output Characteristics
ON	γ ON (0.45)	
OFF	γ OFF (1.0)	

SW1-2	Mode	SW1-3	Colour Temperature
ON	AUTO	ON	2600°K through 9000°K
		OFF	
OFF	PRESET	ON	5600°K (variable)
		OFF	3200°K (fixed)

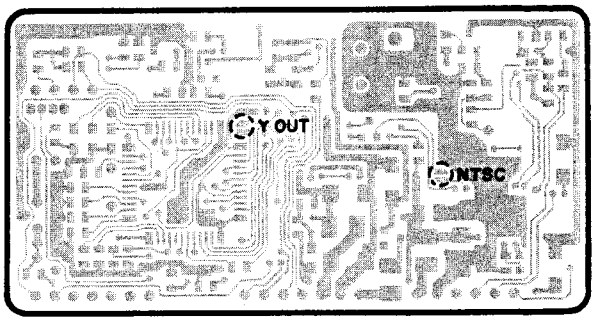


EN-72 board switches (SW1)
(Factory setting)

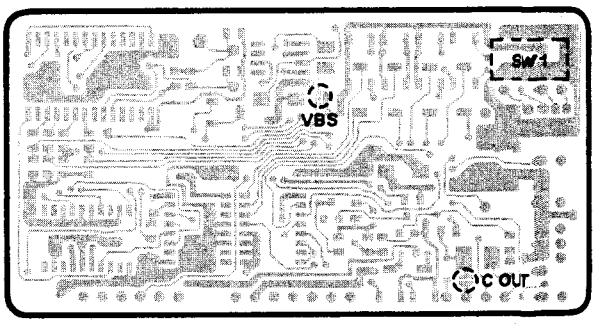
3. Y/C separate mode (COMPOSITE/SEPARATE)
Set the signal format of the video output signal from the DSUB connector (rear pannel).
When it is set to COMPOSITE, the VBS signal is output from pin 6 of the DSUB connector.
However, in chroma signal OFF mode and in γ OFF mode, only the Y (luminance) signal is output.
When it is set to SEPARATE, the Y signal is output from pin 6, and the C (chroma) signal is output from pin 9 of the DSUB connector. However, in chroma signal OFF mode and in γ OFF mode no C signal is output from pin 9.
The setting is performed with the VBS, Y OUT, and C OUT traces on the EN-72 board.
To set to COMPOSITE, short-circuit VBS, and open Y OUT and C OUT. To set to SEPARATE, open VBS, and short-circuit Y OUT and C OUT.
The factory setting is COMPOSITE.

Mode		COMPOSITE	SEPARATE
VBS		Short	Open
Y OUT		Open	Short
C OUT			
DSUB output (example)	Pin 6		
	Pin 9	—	

4. Chroma signal OFF mode
Set this mode for cutting the chroma component of the video signal output in the external synchronization mode. The setting is performed with the NTSC trace on the EN-72 board.
To set the chroma signal OFF mode, short-circuit NTSC. If not, open NTSC.
The factory setting is not the chroma signal OFF mode and NTSC is opened.

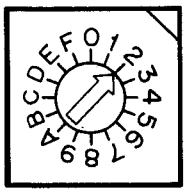


EN-72 BOARD A SIDE



EN-72 BOARD B SIDE

5. GAIN mode (AUTO/FIX)
Set the gain of the RGB and VBS output signals.
If it is set to AUTO, the AGC (Automatic Gain Control) functions. The maximum gain of AGC is +12 dB.
In FIX mode, the gain can be set to −6 dB, 0 dB, +6 dB or +12 dB.
The setting is performed by the rotary digital switch (SW1) on the YC-38 board.
The factory setting is 0 dB mode.



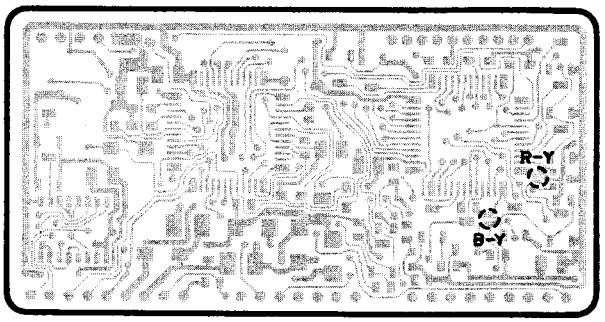
YC-38 board switch (SW1)
(Factory setting)

Position	Mode
0	AUTO
1	FIX −6 dB
2	FIX 0 dB
3	FIX +6 dB
4	FIX +12 dB

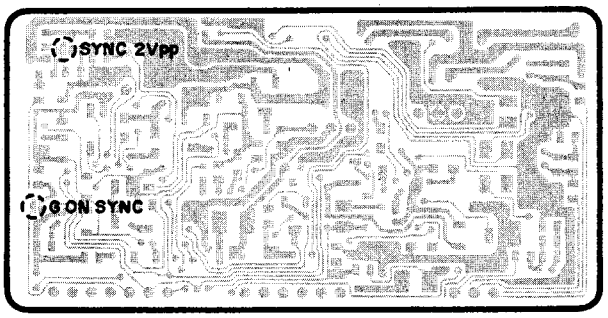
6. G ON SYNC mode
Set this mode for superimposing the SYNC signal to the G (Green) signal in the RGB output signal.
The setting is performed with the G ON SYNC trace on the RD-14 board.
To set to G ON SYNC mode, short-circuit this jumper. If you do not want to set to G ON SYNC mode, open the jumper.
The factory setting is not G ON SYNC mode. (G ON SYNC is open.)

7. SYNC output level (0.3 Vp-p/2.0 Vp-p)
Set the level of the SYNC output signal to be output from pin 7 of the DSUB connector.
The setting is performed with the SYNC 2 Vp-p trace on the RD-14 board.
When the jumper is short-circuited, the SYNC signal of about 2.0 Vp-p is output. When it is opened, the SYNC signal of about 0.3 Vp-p is output.
The sync output level is factory-set to 0.3 Vp-p.

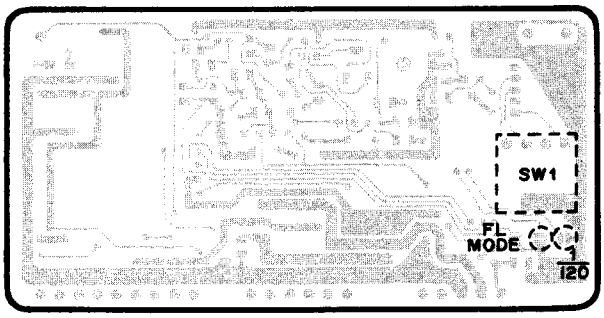
8. HUE PRESET mode
Set this mode for outputting the RGB and VBS output signals without HUE compensation.
The setting is performed with the R-Y and B-Y traces on the PR-122 board.
To set the HUE PRESET mode, short-circuit these two jumpers. When it is not to be set, open both jumpers.
The factory setting is not HUE PRESET mode. (R-Y and B-Y are both open.)



PR-122 BOARD A SIDE



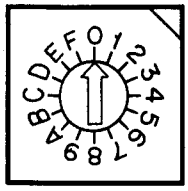
RD-14 BOARD A SIDE



DR-83 BOARD (SUFFIX-12) B SIDE

9. Electronic shutter mode
Set the electronic shutter speed and the flickerless mode. The setting of the shutter speed is performed with the rotary digital switch (SW1) on the DR-83 board. The setting of the flickerless mode is performed with the FL MODE and 1/120 traces on DR-83 board.

Position	Shutter Speed	Flickerless Mode
0 through 7	OFF	×
8	1/60 sec.	○
9	1/125 sec.	
A	1/250 sec.	
B	1/500 sec.	
C	1/1000 sec.	
D	1/2000 sec.	
E	1/4000 sec.	
F	1/10000 sec.	



DR-83 board switch (SW1)
(Factory setting)

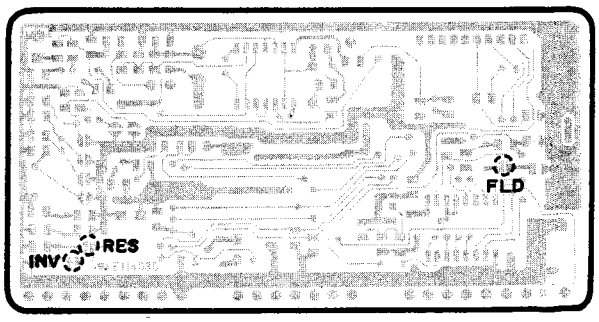
The flickerless mode is for suppressing the flicker of light produced depending upon the frequency of the power source.
Set the traces as follows.
If the flickerless mode is not to be set, open FL MODE.

Power Source Frequency	FL MODE	1/120	Shutter Speed
50 Hz area	Short	Open	1/100 sec.
60 Hz area	Short	Short	1/120 sec.

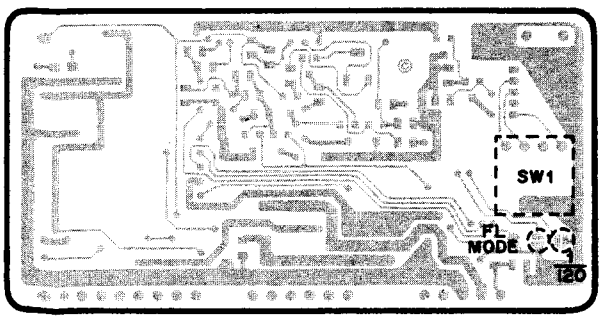
FL MODE and 1/120 are both factory-set to open.

10. Integration mode (FIELD/FRAME)
Set the period in which the signal charge is read from the CCD.
If it is set to FIELD, the signal charge is read from 2 pixel groups simultaneously, which is the field integration mode.
If it is set to FRAME, the signal charge is read from 2 pixel groups alternately, which is the frame integration mode.
In the frame integration mode, the sensitivity in non-interlace mode is half the sensitivity provided in interlace mode.
(Refer to Figure 2 on page 2-11)
The setting is performed with the FLD trace on the TG-48 board.
To set to FIELD, short-circuit FLD. To set to FRAME, open FLD.
The factory setting is FRAME. (FLD is open.)

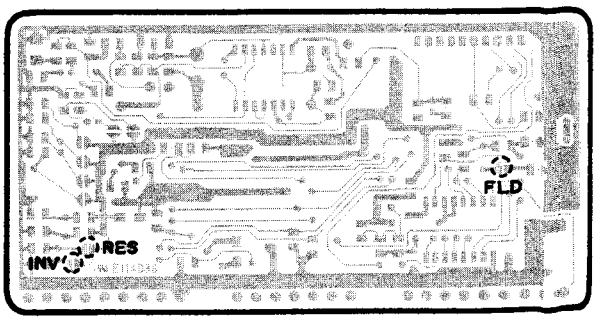
11. Field inversion mode (NORMAL/INVERSE)
If this mode is set in external synchronization mode, the fields of the RGB and VBS output signals are inverted against the external synchronization signal.
If it is set to INVERSE, EVEN is output when the field of the external synchronization signal is ODD and ODD is output when it is EVEN. When NORMAL is set, the operation is the same as for the normal external synchronization signal: when the field of the external synchronization signal is ODD, ODD is output, and when it is EVEN, EVEN is output.
The setting is performed with the INV trace on the TG-48 board. To set to INVERSE, short-circuit INV. To set to NORMAL, open INV.
The factory setting is NORMAL. (INV is open.)



TG-48 BOARD (SUFFIX-12) B SIDE



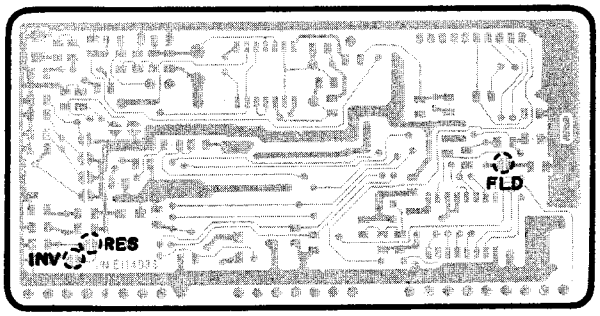
DR-83 BORAD (SUFFIX-11) B SIDE



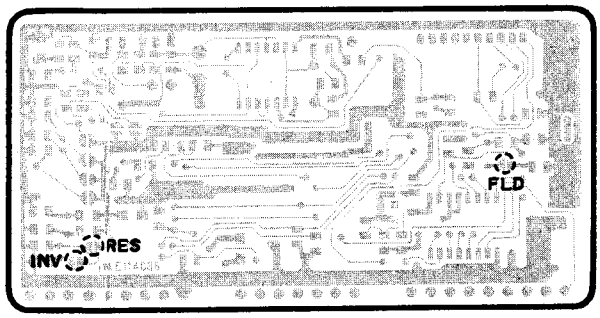
TG-48 BOARD (SUFFIX-11) B SIDE

12. RESTART RESET mode (NORMAL/RESET)
If this mode is set in external synchronization mode, the data of one screen is read out at the desired time.
The setting is performed with the RES trace on the TG-48 board and the NORM VD trace on the MB-222 board.
To set to RESET, short-circuit RES and open NORM VD.
To set to NORMAL, open RES and short-circuit NORM VD.
The factory setting is NORMAL.
(Refer to 2-3-3. RESTART RESET Mode on page 2-15.)

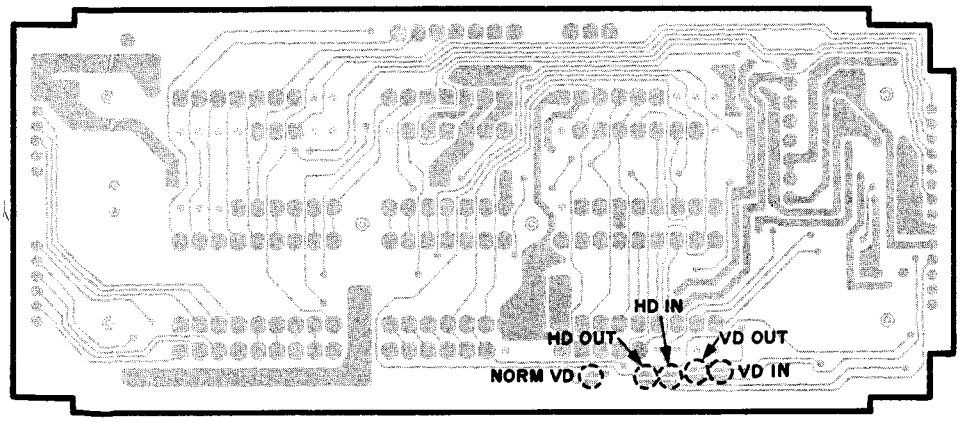
Jumper \ Mode	NORMAL	RESET
RES	Open	Short
NORM VD	Short	Open



TG-48 BOARD (SUFFIX-11) B SIDE



TG-48 BOARD (SUFFIX-12) B SIDE



MB-222 BOARD A SIDE

13. Synchronization mode (INTERNAL/EXTERNAL)
Set to the external synchronization mode (EXTERNAL) or the internal synchronization mode (INTERNAL).
If it is set to EXTERNAL (HD and VD mode), the RGB and VBS output signals which are synchronized with the synchronization signals (HD and VD signals) input from the external equipment, are obtained.
If it is set to INTERNAL, the synchronization signal generated inside can be output.
The setting is performed with the HD IN, HD OUT, VD IN and VD OUT traces on the MB-222 board.
To set to EXTERNAL, short-circuit HD IN and VD IN while opening HD OUT and VD OUT. To set to INTERNAL, open HD IN and VD IN while short-circuiting HD OUT and VD OUT.
The factory setting is external synchronization Mode (EXTERNAL) (HD and VD mode).
(Refer to 2-3-2. HD and VD Mode on page 2-8.)

Jumper \ Mode	EXTERNAL	INTERNAL
HD IN	Short	Open
VD IN		
HD OUT	Open	Short
VD OUT		

SECTION 3
THEORY OF OPERATION

3-1. OPERATION PRINCIPLE OF THE CCD

A CCD (Charge Coupled Device) consists of MOS (Metal-Oxide-Semiconductor) capacitors arranged in a regular array.
It basically performs three functions connected with handling charges.

1. Photoelectric conversion (photosensor)
Incident light generates charges on the MOS capacitors, with the quantity of charge being proportional to the brightness.

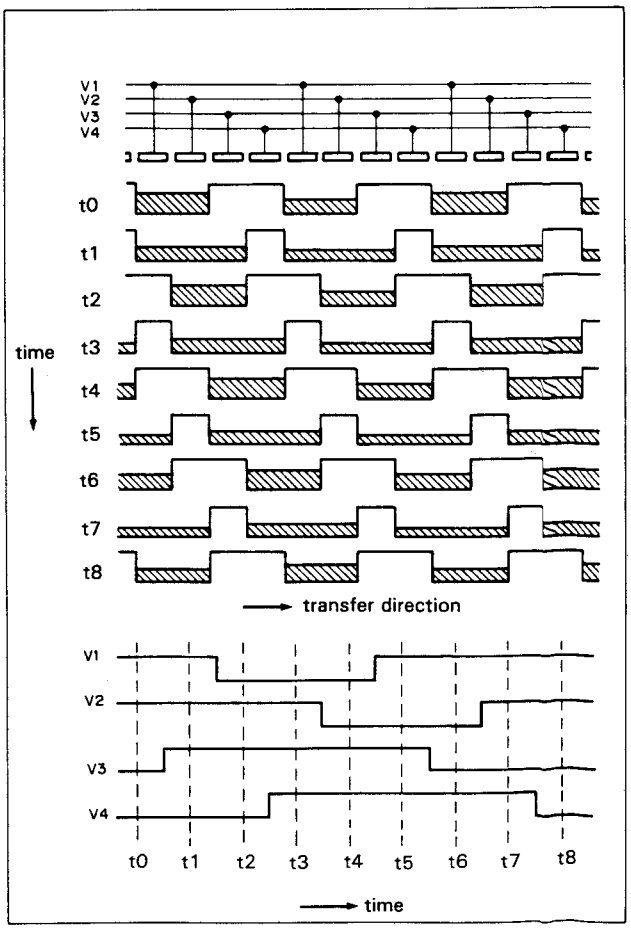
2. Accumulation of charges
When a voltage is applied to the electrodes of the MOS capacitors, an electric potential well is formed in the silicon layer. The charge is accumulated in this well.

3. Transmission of charge
When a high voltage is applied to the electrodes, a deeper well is formed; when a low voltage is applied, a shallower well is formed, In the CCD, this property is used to transmit the charge. When a high voltage is applied to the electrodes, a deep electric potential well is formed, and charge flows in from neighboring well. When this is repeated over and over among the regularly arranged electrodes, the charge is transferred from ones MOS capacitor to another. This is the principle of CCD charge transmission.

3-2. MECHANISM OF CCD CHARGE TRANSFER

The interline transfer system employed by the XC-711P transfers the charges proportional to the brightness of the image produced on the CCD sequentially as shown in Figure 3 on page 3-2. The charge proportional to the brightness of the object is detected by the photo sensor, and transfered to the neighboring vertical shift register. Then this charge is transfered to the horizontal shift register in vertical sequence. Then it is output through the output section in horizontal sequence.

1. Vertical transfer
The vertical shift register transfers charges using a four-phase drive mode. Figure 1 shows an example of the changes which can occur in potential wells in successive time intervals.
At t0, the electrode voltages are (V1 = V2) > (V3 = V4), so the potential wells are deeper toward the electrode at the higher voltages V1 and V2. Charges accumulate in these deep wells.
At t1, the electrode voltages are (V1 = V2 = V3) > (V4), so the charges accumulate in the wells toward the electrode at V1, V2 and V3.
At t2, the electrode voltages are (V2 = V3) > (V4 = V1), so the charges accumulate in the wells toward the electrode at V2 and V3.
Electrode voltage states at t3 and after are shown below.
t3 (V2 = V3 = V4) > (V1)
t4 (V3 = V4) > (V1 = V2)
t5 (V4) > (V1 = V2 = V3)
t6 (V4 = V1) > (V2 = V3)
t7 (V4 = V1 = V2) > (V3)
t8 (V1 = V2) > (V3 = V4) (Initial state)
These operations are repeated to execute the vertical transfer.



[Fig.1] Vertical transfer

2. Horizontal transfer

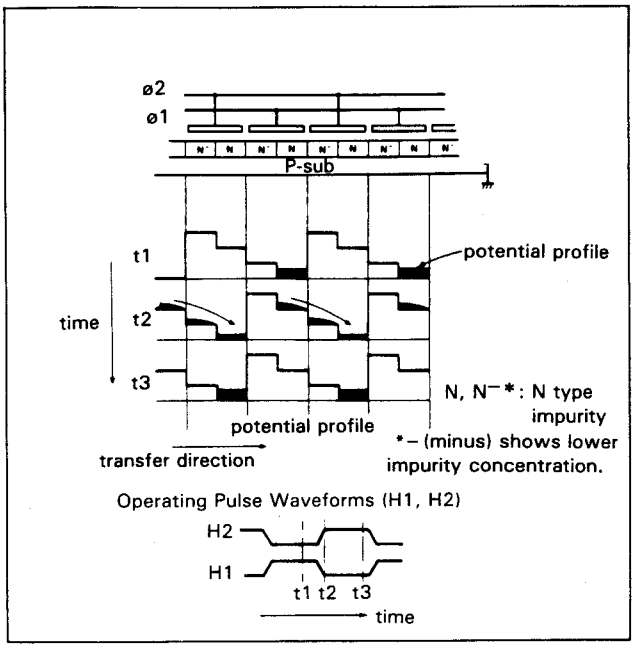
The horizontal shift register transfers charges using a two-phase drive mode. Figure 2 shows an example of the changes which can occur in the potential wells in successive time intervals.

At t1, the electrode voltages are H1 > H2, so the potential wells are deeper toward the electrode of the higher voltage H1. The charges accumulate in these wells.

At t2, the electrode voltages H1 and H2 are inverted, the wells toward the electrode at voltage H2 becomes deeper while the wells toward the electrode at voltage H1 become shallower. So the wells at H2 are deeper than those at H1, the charge flows into the deeper wells toward the electrode at H2.

At t3, the electrode voltage have not changed since t2, so the charge flows into the wells at H2 and one transfer of charge is completed.

These operations are repeated to execute the horizontal transfer.



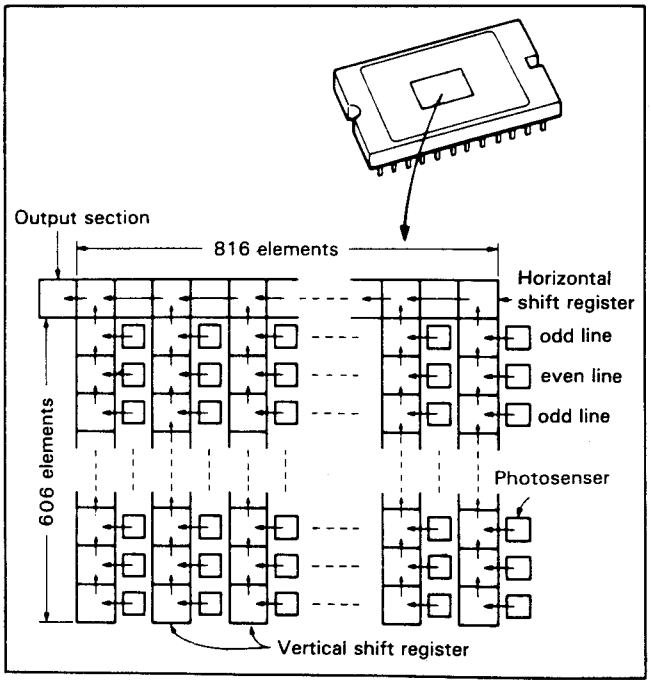
[Fig.2] Horizontal transfer

3-3. BI-26 BOARD

Light which comes through the camera lens strikes the CCD chip surface of IC1 on the BI-26 board. The surface of the CCD contains a number of photosensors.

The array is 816 horizontal photosensors by 606 vertical photosensors, so that there are a total of 494,496. The effective number of them is 756 photosensors by 581 photosensors, so there are total of 439,236. The colour filters of R (Red), G (Green) and B (Blue) are formed on the effective picture elements in vertical stripe configuration. When the incident light passes the colour filters, it is divided into the colour elements R, G and B. The divided colours are converted into electrical charge proportional to the brightness of each colour. The converted signal charge is read out by a register from the photosensor, and is transferred in sequence and fed to the output section. The register is subdivided into horizontal and vertical shift registrs. As shown in Fig. 3, there are 816 vertical rows of registers, while there is only one horizontal row of registers, across the top. Each converted charge is transmitted every field (frequency of VD) to the vertical shift register adjoining to the photosensor. The signal charge is then vertically transferred in sequence at the vertical transfer clock V1, V2, V3 and V4 (frequency of HD ;fH) to the horizontal register. The horizontal registers transfer charges horizontally at the horizontal transfer clock H1, H2 (= 908 fH) to the output section. The output from IC1 is output after the electrical charge has been converted to a voltage signal by the capacitor at the output section. It is then sent to the PR-122 board after passing buffer Q1.

IC2 is a horizontal clock driver. Q2 to Q7 are PG drivers which reset the electrical charge read out by one picture element.



[Fig.3] The interline-transfer organization of the CCD image sensors

3-4. PR-122 BOARD

This PC board has the function of generating the colour difference signal and the luminance signal by the colour signal of RGB from the CCD output signal.
Furthermore, it can perform white balance adjustment and gamma compensation for the RGB signal, and the hue compensation for the colour difference signal.
In order to remove the noise component peculiar to the CCD output signal, the CCD output signal of the BI-26 board first passes through the sample and hold circuit (the double compensation sampling method) within IC1. Then it is divided into two signals, one of which is amplified in IC1, passes through Q1, Q2 and Q3 and is output as the signal that controls the lens iris. The other one passes through the AGC circuit in IC1 and is divided into two signals. One of the divided signals detects the auto gain, passes through the AGC detection circuit (consisting of Q5 and Q6, and the operational amplifier 1 within IC1), and is output to the YC-38 board via the MB-222 board (DET DC). The other signal passes through R3, decodes colour signals of RGB at the sample and hold circuit for each colour in IC1, and is output from IC1.
The gain of the AGC circuit is determined by the DC voltage (AGC CTL) transmitted from the YC-38 board. If there is no YC-38 board, it is determined by the DC voltage output from IC3. IC3 only operates at the time of adjustments.
Each colour signal of RGB output from IC1 is input to IC2 after being passed through the LPF consisting of condenser and resistor, and is divided into two groups.
One of which is input to the white balance circuit. The white balance circuit is controlled by the DC voltage (R CONT and B CONT) created at the MD-61 board.
Then, it passes through the gamma compensation circuit and forms the R-Y and B-Y colour difference signals at the matrix operation circuit. These colour difference signals are output from IC2 after being passed through the hue compensation circuit.
If the gamma correction mode is OFF, the gamma correction circuit, the matrix operation circuit and the hue compensation circuit are bypassed and the RGB signals are output directly.
The other group is input to the luminance balance circuit. Then it is divided into two groups, one of which forms the luminance-balanced Y_H signal (R = G = B). The other forms the Y_L signal at the matrix operation circuit. Then these signals are output from IC2 as the Y_H signal and the Y_L-Y_H signal.
If the gamma compensation mode is OFF, Y_H is output as the Y_L signal and Y_L-Y_H is output as the G component.
The Y_L-Y_H signal output from IC2 passes through the active LPF (Q7 and Q8) and is output together with the Y_H signal to the EN-72 board via the MB-222 board. After being passed through the buffers (R-Y; Q19, B-Y; Q20), the colour difference signals are output to the MD-61 and the EN-72 boards via the MB-222 board. However, the signals are output to the EN-72 board only after the band limitation has been performed by the each active LPF (R-Y; Q11 and Q12, R-Y; Q9 and Q10).

3-5. MD-61 BOARD

This PC board has the functions of reproducing RGB signals from the colour difference signal and the G signal, and of generating the control signal of the white balance circuit (PR-122 board).

• Reproduction circuit for RGB signals
The colour difference signal and the G signal transmitted from the PR-122 board are inversely amplified, and then the R signal and the B signal are reproduced by the linear matrix operation circuit. The R signal is output from IC1, the B signal is output from IC5. The G signal is separated from the Q10 emitter before being inversely amplified.
The RGB signals reproduced in this way, is then input into the group 0 of the analog switch IC3.
When the gamma compensation mode is OFF, the colour difference signals (R-Y and B-Y) and the G signal transmitted from the PR-122 board are directly input into the group 1 of IC3.
IC3 is switched by the gamma compensation mode set by SW1 of the EN-72 board.
If gamma is ON, the group 0 is selected, and if gamma is OFF, the group 1 is selected.
All signals of group 0 or 1 output from IC3, are amplified. Then, they pass through the trap LPF (4.77 MHz) to remove the clock noise, and are output to the RD-14 board via the MB-222 board.

• White Balance Control Signal Generation Circuit
This circuit has the following 3 modes.

a. Preset White Balance (3200°K) Mode
It is preset by R47 to R50 in order to obtain the white balance when the object has a colour temperature of 3200°K.

b. Preset White Balance (5600°K) Mode
It is preset by RV5 and RV6 in order to obtain the white balance when the object has a colour temperature of 5600°K. However, by adjusting RV5 and RV6, the preset value of the colour temperature can be changed to a range of 2600°K to 9000°K.

c. Auto White Balance (2600°K to 9000°K) Mode
The white balance detection signals (DET R, DET G and DET B) transmitted from the PR-122 board are each peak-held. Then, the detection voltage of G is compared to that of R and it is compared to that of B, at IC2. If there is a difference in the results of this operation, the output of IC2 changes.
If the detection voltage of G is lower, the output of IC2 (R; pin 7, B; pin 1) increases, and the amplifier gain of the R and B signals in the white balance circuit in IC2 of the PR-122 board, is decreased. (This amplifier gain is inversely proportional to the voltage applied.)
With this operation, the white balance is adjusted automatically according to the colour temperature of the object.
RV2 is for offset adjustment of the detection voltage of R (pin 7 of IC2), RV4 is for offset adjustment of the detection voltage of B (pin 1 of IC2).

These three white balance control signals are input into analog switch IC4. IC4 is switched by SW1 of the EN-72 board.

Mode	EN-72 board SW1	
	SW1-2	SW1-3
a	OFF	OFF
b	OFF	ON
c	ON	OFF/ON

The output of IC4 is output to the PR-14 board via the MB-222 board.

3-6. RD-14 BOARD

This PC board processes the RGB signals transmitted from the MD-61 board, and the SYNC signal transmitted from the TG-48 board to be output to the external equipment.
The RGB signals are input into signal processors IC1 through IC3 respectively. (These ICs are for video signal processing. However, at this PC board, the only luminance system processing is used.)
At all ICs, the signals are output after contour compensation, level amplification, white clipping and setup addition have been performed.
The signals are then output to the CN-295 board via the MB-222 board after being passed through video amplifiers IC4 to IC6.
The SYNC signal is divided into two signals and sent to the CN-295 board in two ways. The one way is the G ON SYNC mode that adds the SYNC signal to the G signal and outputs it. This is performed by inputting the sync signal into IC2. Simultaneously, the SYNC level is adjusted at RV12.
The other one is outputting the SYNC signal independently: the divided SYNC signal is buffered (Q1) and then voltage-divided at R16 and R17, passed through the drive buffer (Q2 to Q5) and output. The SYNC output level at that time is 0.3 Vp-p, but it can be changed to 2 Vp-p by short-circuiting R16 (jumper 2Vpp).

3-7. EN-72 BOARD

This PC board is an encoder that forms the VBS signal from the luminance signals (Y_H and Y_L-Y_H) and the colour difference signals (R-Y and B-Y) output from the PR-122 board. It contains the signal generation circuit that generates all synchronization signals and clocks for the encoder, and the switches (SW1) for setting the gamma compensation mode and the white balance mode.
The Y_H signal is input into IC2 after the 4.2 MHz band limitation was performed at LPF. The Y_L-Y_H signal is input into IC2 after being passed through analog switch IC1.
The Y_H signal is added with the Y_L-Y_H signal after passing the contour compensation circuit, and becomes the Y signal. The Y signal consists of the low-frequency component (Y_L) which determines the visibility, and the high-frequency component (Y_H) which determines the resolution.
The Y signal is sent to the encoder circuit after signal processing such as level amplification, white clipping, and setup addition have been performed.
The R-Y and B-Y signals are directly input into IC2. They are added with the burst signal to become the chroma signal after clamping and balanced modulation have been performed. This balanced modulation can provide a stable carrier balance due to the auto carrier balance function, the circuit being a nonadjustable circuit.
The chroma signal is once output from IC2 and then input into IC2 again after being passed through the BPF (L6 and C45). At that time, it is possible to divide the chroma signal before BPF and output it to the YC-38 board. The chroma signal which is again input into IC2 is composited with the Y signal, becomes the VBS signal and is output from IC2. Then it is divided into two signals, one of which passes through video amplifier IC3 and is output to the CN-295 board via the MB-222 board. The other one is directly output to the YC-38 board via the MB-222 board.
As the Y signal itself is also output from IC2 at the same time, it can be output to the YC-38 board instead of the VBS signal. IC1 switches over the control voltage in order to perform the level amplification at IC2 switable for the gamma compensation mode (γON/γOFF)
When gamma is ON, the voltage divided at RV1 is output from IC1, when gamma is OFF, the voltage divided at RV2 is output from IC1.
With gamma OFF, analog switch Q4 is set to ON so that no chroma signal is output from IC2. In this mode, the VBS output does not contain the chroma component but only the luminance component.
IC6 is a synchronization signal generator that generates the timing pulse necessary at IC2. This is a double synchronization generator that uses IC4 of the TG-48 board as master generator and IC6 of the EN-72 board as slave generator.
The SYNC signal (M SYNC) transmitted from the master generator is input into IC4 to create the H reset pulse and the V reset pulse. The H reset pulse is input to IC6 after phase adjustment by IC5. The V reset pulse is input into IC6 directly. The EXT/$\overline{\text{INT}}$ signal of IC4 is input into the EXT terminal of IC6 so that IC6 becomes the slave SYNC generator for the master SYNC generator.
The 17.734 MHz clock oscillated at X1 is input into the 4FSC input after having been buffered at Q3.

3-8. YC-38 BOARD

This PC board has a Y amplifier and a C amplifier to correspond to the Y/C separate outputs, and a circuit that sets and outputs the control voltage for the AGC circuit of the PR-122 board.
If the Y/C separate mode is set, the Y signal and the C signal are transmitted from the EN-72 board. If it is not set, VBS signal instead of Y signal is transmitted. In that case, the C signal is not transmitted. IC1 is the video amplifier for the Y signal. IC2 is the video amplifier for the C signal. The outputs of these amplifiers are sent to the CN-295 board via the MB-222 board.
The INHIBIT signal output from this PC board disables analog switch IC3 of the PR-122 board so that the camera gain setting can be performed on the YC-38 board. RV3 to RV6 set the gain control voltage. The DET DC signal is a gain control voltage signal in AGC mode. They are switched at analog switch IC3 depending upon the setting of SW1. The output (AGC CTL) of IC3 is sent to the PR-122 board via the MB-222 board.

3-9. CN-295 BOARD

This PC board is united with connectors of the rear panel. All the signal exchanges with the external equipment is performed here.
The RGB signal, the SYNC signal and the VBS signal (or the luminance signal and the chroma signal) are output from the 9-pin DSUB connector.
The VBS signal (or luminance signal) is output from the BNC connector.
At the 12-pin multi connector, the power supply voltage (+12 V) and the external synchronization signal (EXT HD, EXT VD or VBS and VS) are input, and the VBS signal and the synchronization signal (CLK, HD, VD) are output.
The 4-pin female connector outputs the power (+12 V) and the detection video signal for the auto iris lens.
For details, refer to 1-3. PARTS LOCATION, FUNCTION AND OPERATION.

3-10. MB-222 BOARD

This PC board contains the external synchronization signal separation circuit, the synchronization signal output buffer and the DC-DC converter. Furthermore, it serves as the mother PC board.

• External Synchronization Signal Separation Circuit
The VBS signal, the VS signal or the VD signal can be input into the EXT VD line from the external equipment. With the VBS signal or the VS signal, pass through buffer Q2, and the chroma component is suppressed by the LPF (R31 and C19).
Then, the SYNC component in the signal is separated and detected by Q3. This SYNC signal is wave-shaped in IC1 and then output to the TG-48 board (EX VD).
With the VD signal, the above circuit works simply as a wave-shape circuit so that the signal has the sufficient amplitude. When there is no signal, it is set to High level.
The HD signal is input into the EXT HD line from the external equipment. The HD signal passes through buffer Q1 and is output (EX HD) to the TG-48 board after being inversely wave-shaped at IC1. When there is no signal, it becomes Low level.

• Synchronization Signal Output Buffer
The VD signal, HD signal and CLK signal sent from the TG-48 board, are output to the CN-295 board after being buffered at this PC board. Q4 is the buffer for the VD signal, Q5 for the HD signal and Q6 for the CLK signal. If the internal synchronization mode is not set, the VD signal and the HD signal cannot be output to the CN-295 board.

• DC-DC Converter
The power (+12 V) provided from the external equipment is switched to different voltages of −5 V, +5 V, +7 V, +15 V and +25 V by the DC-DC converter and supplied to every PC board.

3-11. TG-48 BOARD

This PC board contains a synchronization signal generator circuit for external synchronization modes, a timing pulse generator circuit for driving the CCD and for signal processing.
IC4 detects whether there is the external synchronization signal or not. If external synchronization signal is input, it is automatically switched to external synchronization mode. It outputs synchronization signals synchronized to this signal.

SYNC: composite SYNC signal (master SYNC)
BLK: blanking signal
HD, VD: horizontal and vertical synchronization signals
FLD: field discrimination signal
INT/EXT: synchronization mode discrimination flag

In the 28 MHz oscillator circuit there are two kinds of oscillations: the liquid cristal oscillation and the quartz oscillation.
In external synchronization mode, the liquid crystal oscillator circuit operates. This liquid crystal oscillator circuit is a VCO and composes the PLL by IC4 and phase comparator IC6. Therefore, it outputs a clock completely locked- in to the external synchronization signal.
In internal synchronization signal mode, the quartz oscillator circuit operates and outputs a clock of 28.375 MHz. One of these clocks is input into IC2 together with the HD and VD signals of IC4, and the timing pulses for driving the CCD and for signal processing are generated.

CLK: 14 MHz (908 f_H) clock
XPG: CCD precharge gate clock
XH1, XH2: 2-phase clock for horizontal CCD transfer
XV1 to XV4: 4-phase clock for vertical CCD transfer
SHP, SHD: double correlation sampling pulse for the CCD output signal

IC1 is the system data writing completion ROM supplied with the CCD. If the ROM has the address for compensation of defects in the CCD, the same serial number as the CCD is attached on it.
IC3 makes the WINDOW signal from the VD signal.

3-12. DR-83 BOARD

This PC board contains the clock drive circuit for vertical transfer of the CCD and the electronic shutter control circuit.

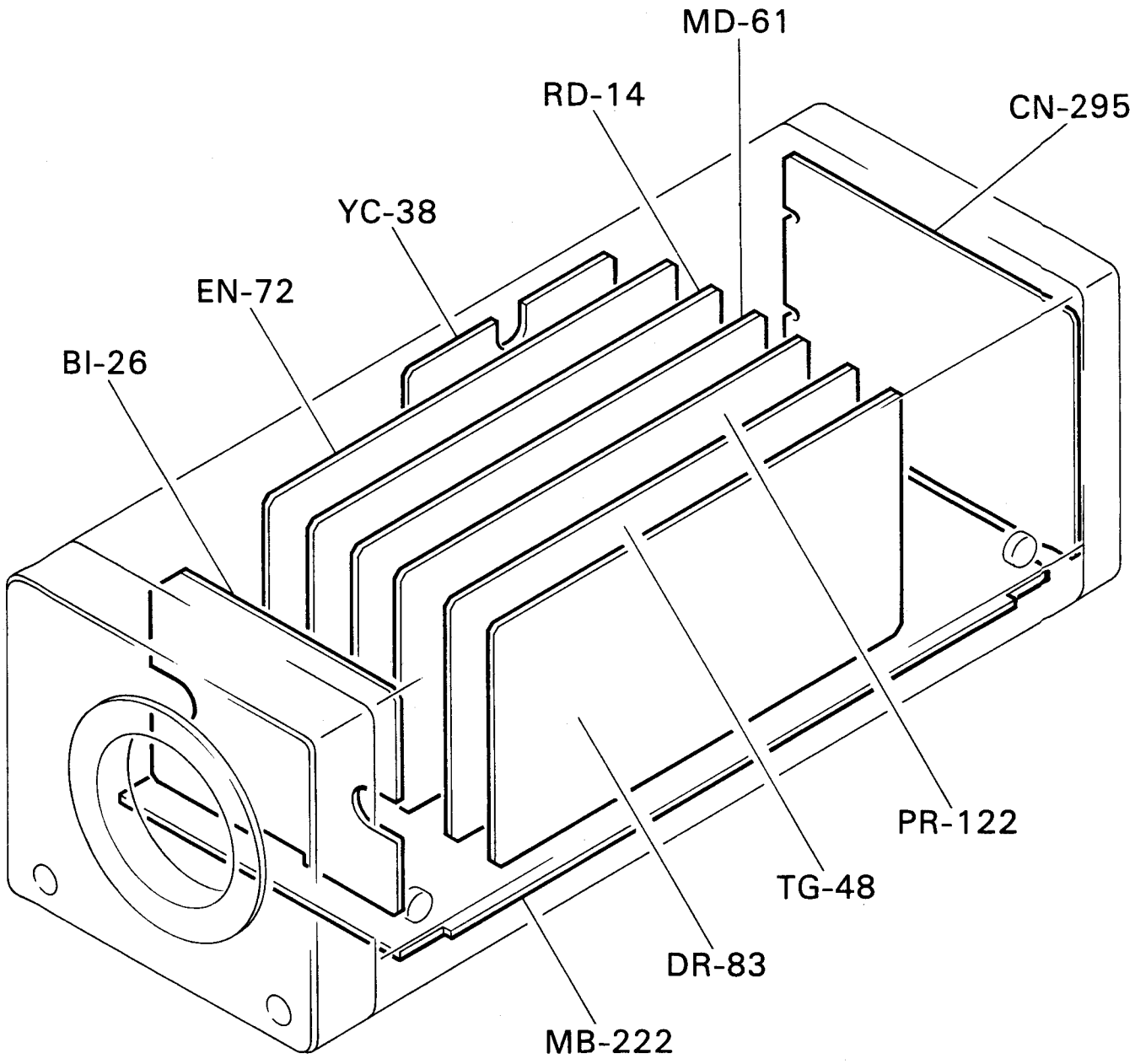
• Clock Drive Circuit for Vertical Transfer of CCD
After pulses XV1 to XV4, XSG1 and XSG2 sent from the TG-48 board have been amplified at clock driver IC1, CCD drive pulses V1 to V4 are output. These drive pulses are clamped at D7 to D9 and output to the BI-26 board via the MB-222 board. The clamp voltage at this time is a negative voltage VL created by the VL output of IC1 and D6. The negative voltage VL is also output to the BI-26 board via the MB-222 board.
Q1 to Q3 are the regulators that form the power supply voltage necessary for IC1.

• Electronic Shutter Control Circuit
The signals XV4, XSG1, PS, HD and VD sent from the TG-48 board are input here, and the pulse (XSUB) for the electronic shutter is generated at IC3. XSUB passes through the drive buffer of Q7 to Q10 and is output (SUB CTL) to the BI-26 board via the MB-222 board after being clamped (D1). The clamp voltage at that time has been created by regulator (Q4 to Q6), and becomes the normal bias voltage for the SUB terminal of the CCD.
The electronic shutter is operated by modulating the bias voltage for the SUB terminal with XSUB.
The speed of the electronic shutter (time of storage of electrical charge) is set by SW1.

SECTION 4
ALIGNMENT

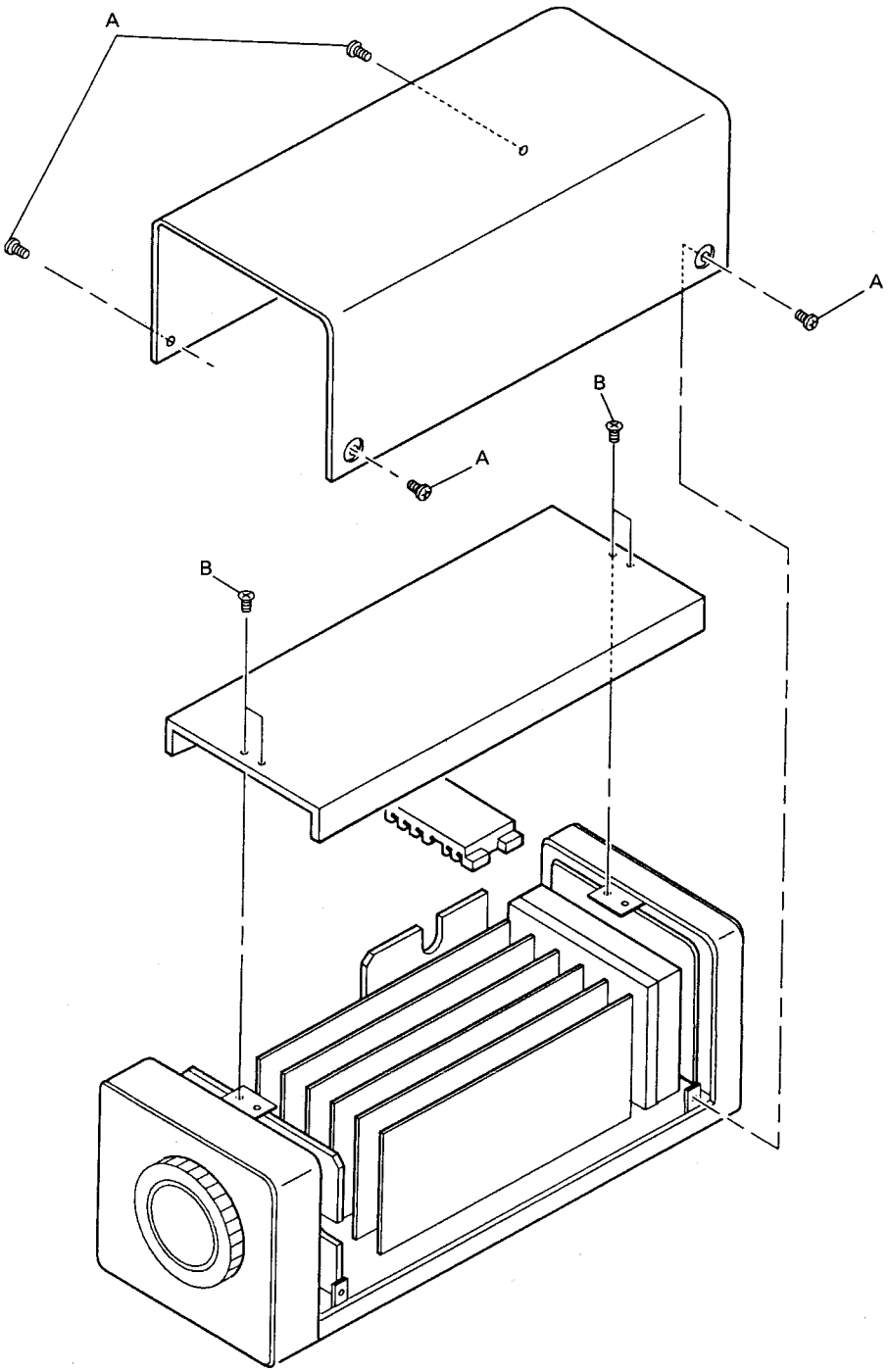
4-1. PREPARATOR INFORMATION ADJUSTMENT

4-1-1. Location of Board

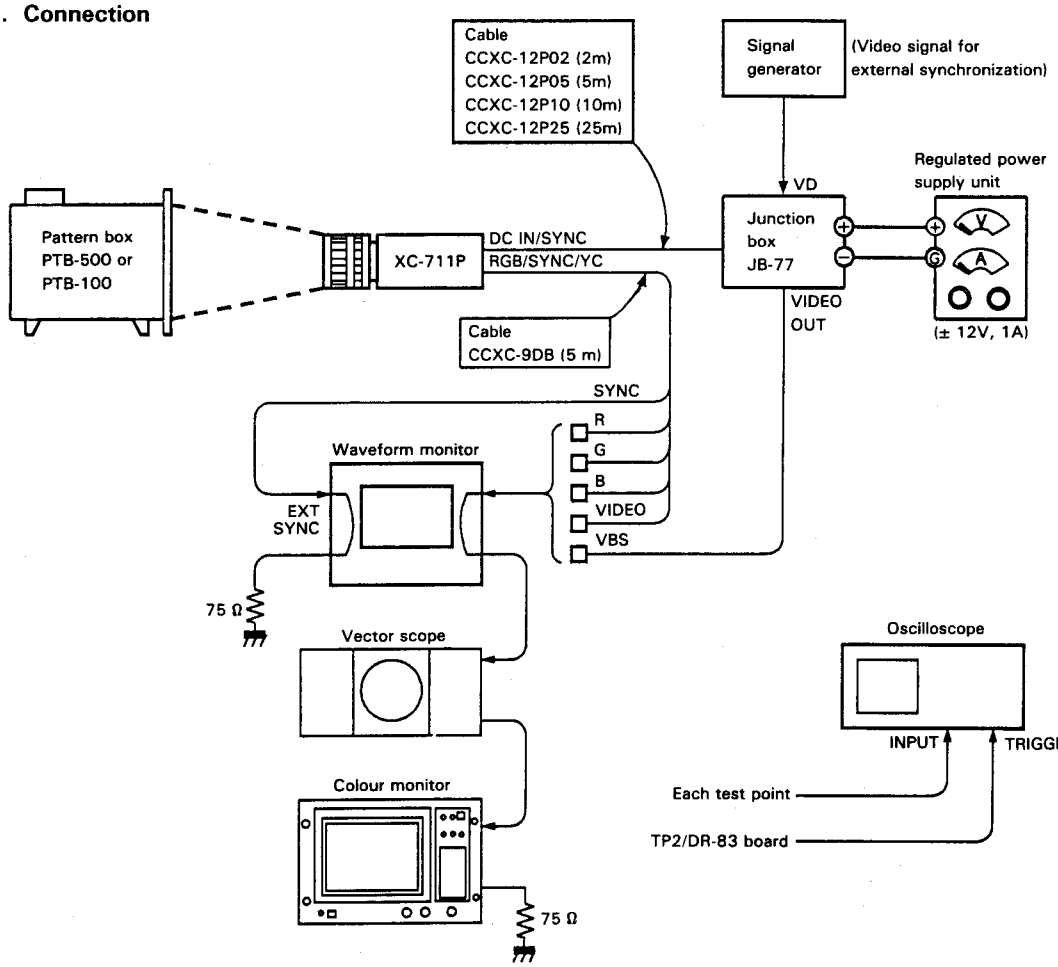


4-1-2. Removal of Outer Panels

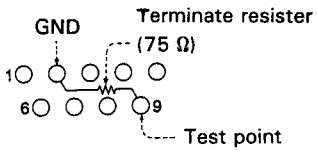
Remove the four fixing screws A (Precision + P2 x 4), and remove the camera cover.
Remove the four fixing screws B (Precision + K2 x 4), which is fixing the STAY to the chassis, then remove the PC BOARD HOLDER.



4-1-3. Connection

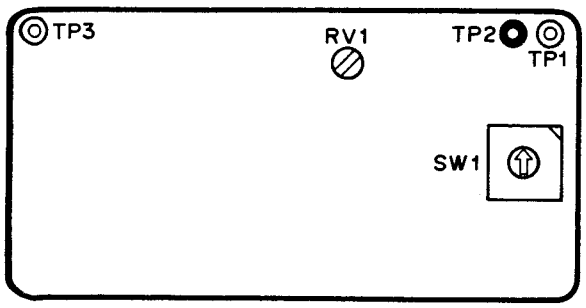


• Termination at the oscilloscope
For "4-4-8. C Gain Adjustment (YC-38 Board)", terminate the measuring point at 75 ohms, then observe the waveform and adjust it. (Refer to the Fig. on the right.)

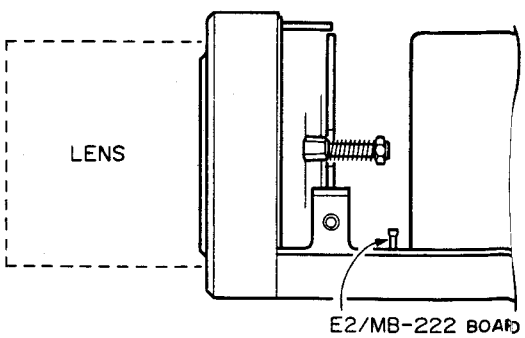


CN-295 board A side
(DSUB connector)

• Trigger input of the oscilloscope
For observing the waveform by using an oscilloscope, a trigger input is necessary.
Input the HD signal (TP2/DR-83 board) to the trigger input.
Connect the GND to the E2/MB-222 board.



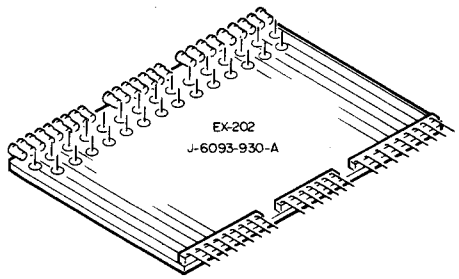
DR-83 BOARD (B SIDE)



4-1-4. Adjustment Fixtures and Equipment

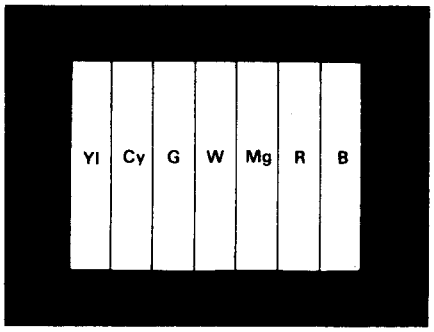
J-6093-930-A	Extension Board (EX-202)

• For PR-122 board adjustment



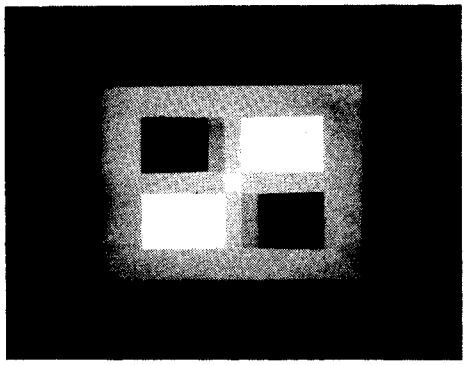
J-6020-250-A	Colour-Bar Chart

• For colour adjustment.



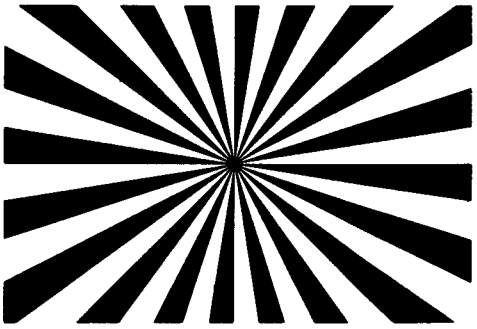
J-6026-130-B	Grayscale Chart

• For video level and gamma adjustment, etc.



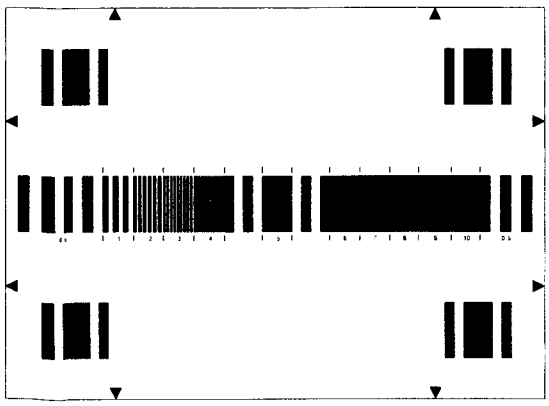
J-6024-340-B	Siemens Star Chart

• For back focus adjustment

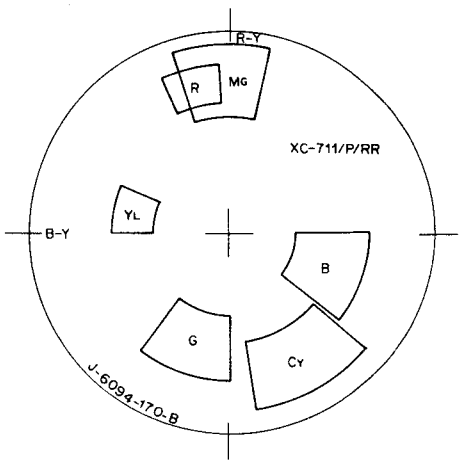


J-6021-910-A	Inmega Chart

• For aparture Adjustment

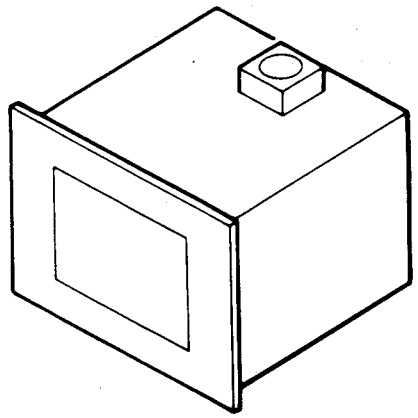


J-6094-170-B	Vectorscope Scale

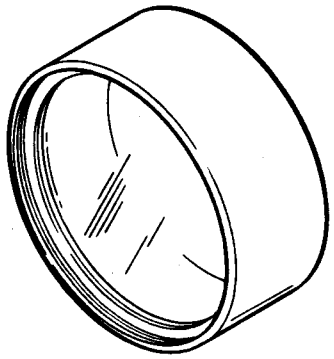


J-6020-490-A	Pattern Box PTB-100 (90 to 130 V)
J-6020-140-A	Pattern Box PTB-500 (90 to 240 V)

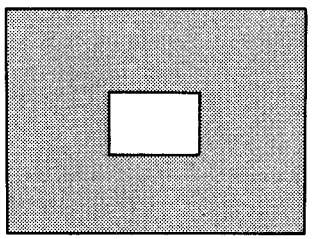
• Light source for test charts



J-6080-058-A	LB140 Filter
J-6029-590-A	LB200 Filter



White Window Chart



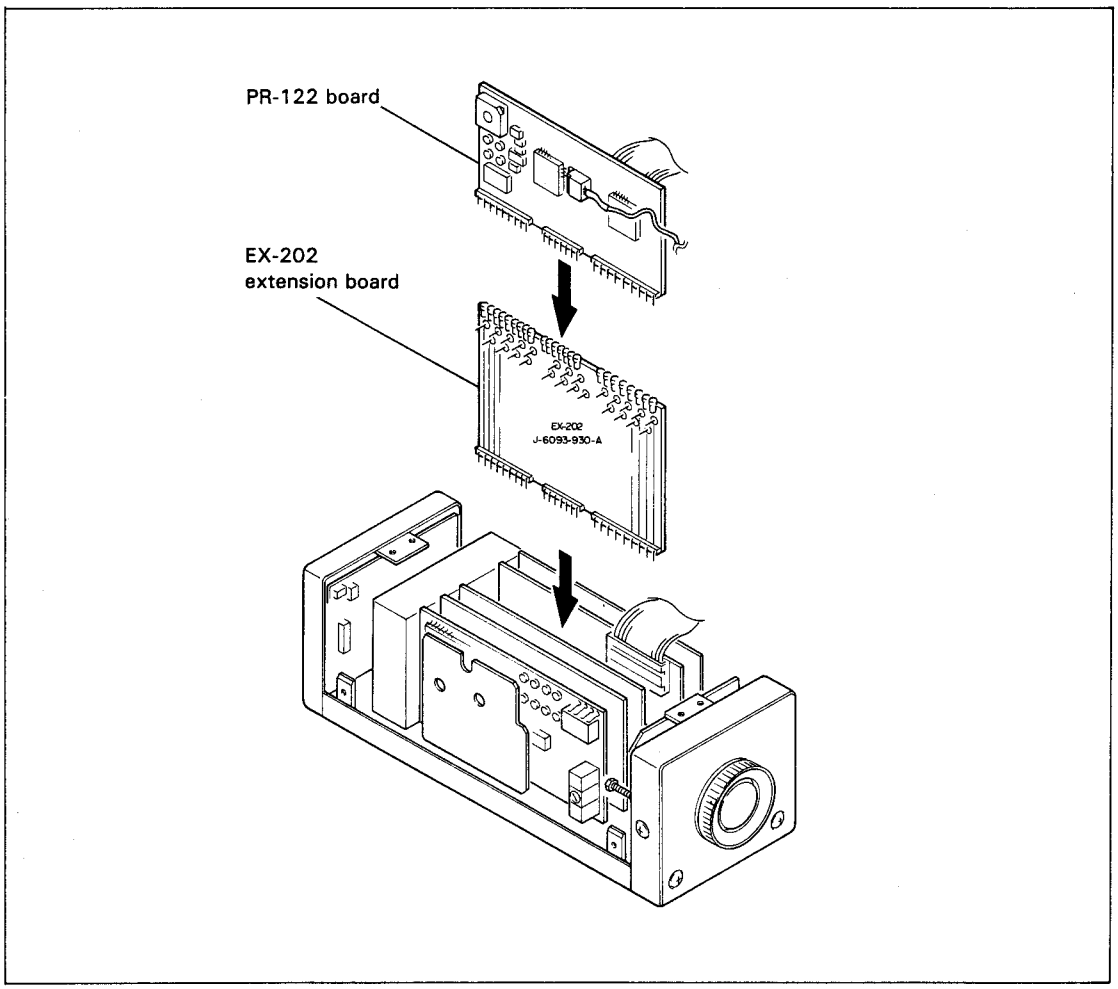
Make a hole in the center of black paper as shown in the figure.

Commercial measuring equipment and fixture

- Dual Trace Oscilloscope
- Vectorscope
- Wareform Monitor (WFM)
- Frequency Counter
- Digital Voltmeter
- Colour Monitor
- Lens (C mount and manual iris type)

4-1-5. Mounting of EX-202 Extension Board

1. Remove the outer panels by "4-1-2. Removal of Outer Panels".
2. Remove the DR-83 board.
3. Remove the TG-48 board.
4. Remove the PR-122 board.
5. Mount the extension board to the position where the PR-122 board has been removed from.
6. Mount the PR-122 board on the extension board.



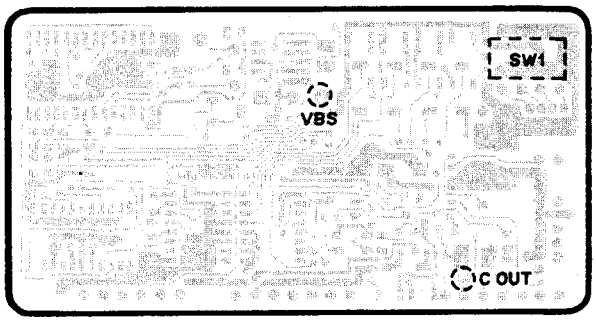
7. Mount the TG-48 board in place.
8. Mount the DR-83 board in place.

NOTE: EX-202 can be used not only for extension of the PR-122 board but also for the DR-83, TG-48, MD-61, RD-14 and EN-72 boards.

4-2. PREPARATION

4-2-1. Operation Before Adjustment.

Remove the YC-38 board from the MB-222 board, and short-circuit the "C OUT" jumper of the EN-72 board.



EN-72 BOARD B SIDE

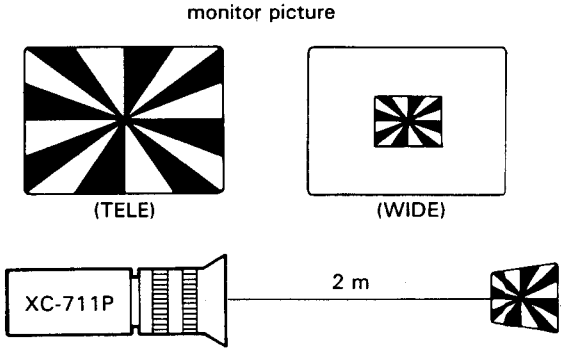
Mount the PR-122 board to the MB-222 board via the EX-202 extension board.
Refer to "4-1-5. Mounting of EX-202 Extension Board".
Set the switches as follows

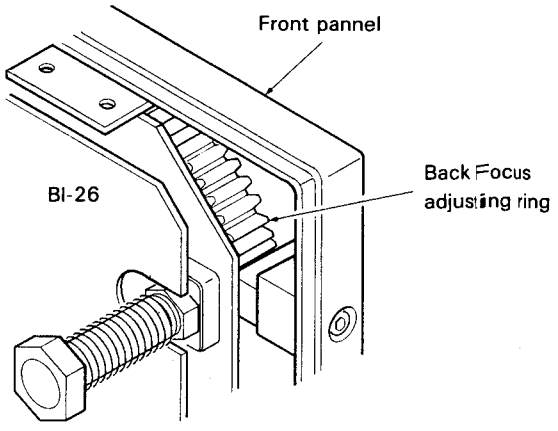
- PR-122 board. SW1 ..... "2"
- DR-83 board. SW1 ..... "0"
- EN-72 board. SW1-1 ..... "OFF"
  -2 ..... "OFF"
  -3 ..... "OFF"
  -4 ..... "OFF"

4-2-2. Mechanical Back Focus Adjustment

Subject: Siemens Star chart
Lens iris: Open
Equipment: Colour monitor
Test point: VBS OUT
Adjust:

1. Set the zoom control at TELE so as to obtain the maximum multiplication factor. Optically focus the image so as to obtain the maximum resolution.
2. Set the zoom control at WIDE so as to obtain the minimum multiplication factor. Do not optically focus the image at thie time.
   Check whether the image is focused, on the monitor while turning the zoom control from TELE to WIDE.
   If the image is not focused, properly set at back focus as follows.
3. When the zooming mechanism is set at WIDE, turn the back focus adjusting ring.
4. Repeat step 1 through 3 several times.





4-3. BASIS SYSTEM

4-3-1. VCO Voltage Adjustment

Preparation: Supplying the HD and VD signals (or VS/VBS signal)
Equipment: Digital voltmeter
Test point: TP1 (GND: E2/MB-222 board)/TG-48 board
Adj.point: ◐CV1/TG-48 board
Spec.: 2.8 ± 0.1 V

NOTE: When this adjustment is finished, no HD and VD signals are necessary any more. Turn off the power of the external synchronization signal generator.

4-3-2. CCD Substratum Voltage Adjustment

Equipment: Digital voltmeter
Test point: TP3 (GND: E2/MB-222 board)/DR-83 board
Adj.point: ◐RV1/DR-83 board
Spec.: Establishment value ± 0.1 V

Establishment value
When you replace the CCD image device, refer to the 2-digit code on the rear of the new CCD image device.
If you do not replace the CCD image device, refer to the 2-digit code indicated on the label stuck on the inside of the front panel.
When you replace the CCD image device, make sure to change the code, indicated on the label stuck on the inside of the front panel, to the code indicated on the rear of the new CCD image device.

2 digit-code display: □□ ← Decimal
Integral

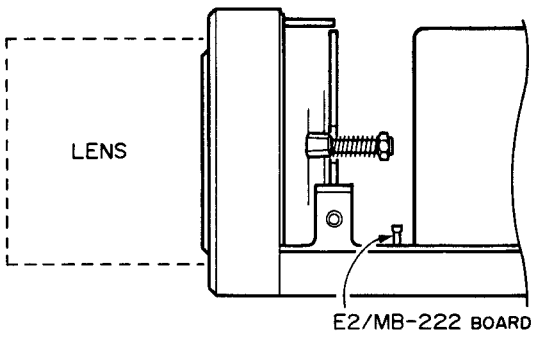
The code integrals and the real value correspond with each other as follows:

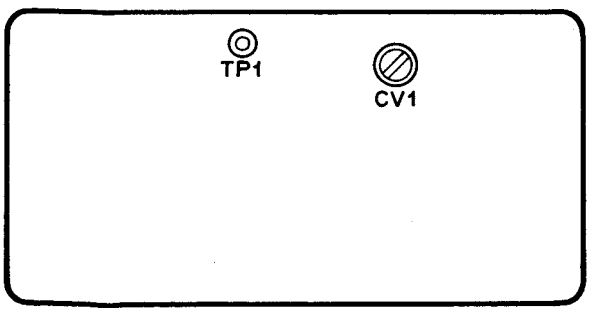
Code integral	9	A	B	C	D	E	F	G	H	I	J
Value	9	10	11	12	13	14	15	16	17	18	19

<Example> F5 → 15.5 (V)

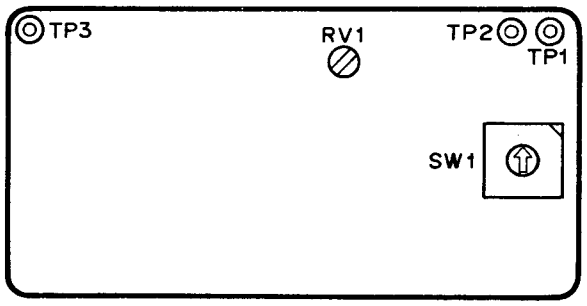
4-3-3. Sub-carrier Source Frequency Adjustment

Equipment: Frequency counter
Test point: TP1 (GND: E2/MB-222 board)/EN-72 board
Adj. point: ◐CV1/EN-72 board
Spec.: 17, 734, 475 ± 100 Hz





TG-48 BOARD (A SIDE)



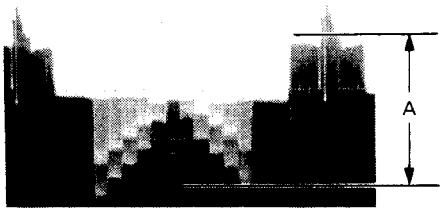
DR-83 BOARD (B SIDE)

4-4. PROCESS SYSTEM

4-4-1. Video Gain Adjustment (PR-122 Board)

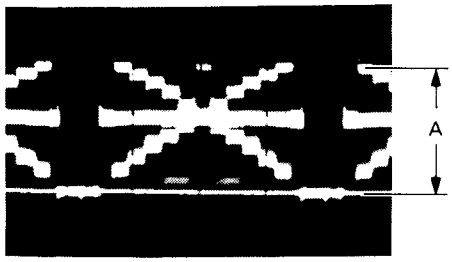
Subject: Grayscale chart
Adjust:

1. Equipment: Oscilloscope
   Test point: TP1 (GND: Pin 9/Extension board)/PR-122 board
   Adj. point: Lens iris
   Spec.: A = 94 ± 10 mV



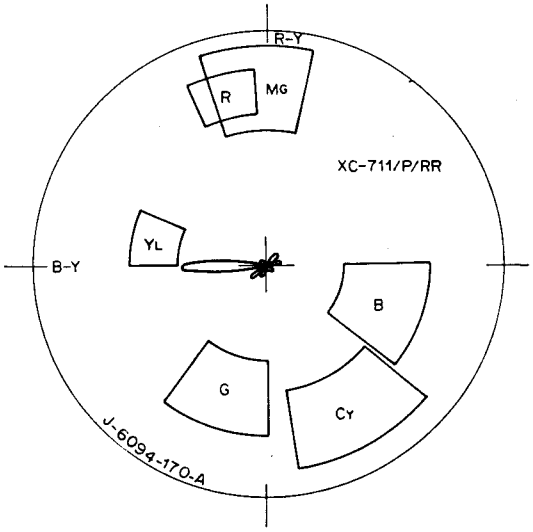
2. Preparation: SW1/PR-122 board .... "4"
   Equipment: Oscilloscope
   Test point: TP2 (GND: Pin 9/Extension board)/PR-122 board
   Adj. point: ◐RV14/PR-122 board
   Spec.: A = 1000 ± 40 mV

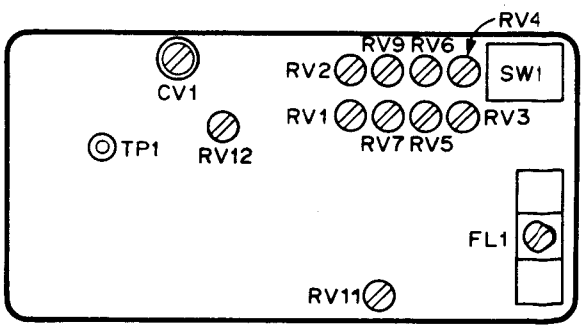
3. Preparation: SW1/PR-122 board .... "2"
   Equipment: Oscilloscope
   Test point: TP2 (GND: Pin 9/Extension board)/PR-122 board
   Adj. point: ◐RV12/PR-122 board
   Spec.: A = 250 ± 10 mV



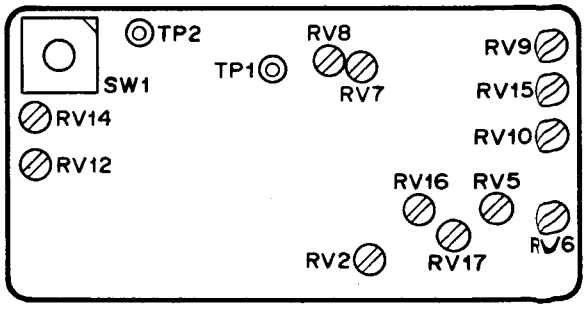
Adjust 2 and 3

4. Equipment: Vectorscope
   Test point: VBS OUT
   Adj. point: ◐RV7, ◐RV8/PR-122 board (alternately adjust)
   Spec.: Bright spot is at the center of the vectorscope screen.





EN-72 BOARD (B SIDE)

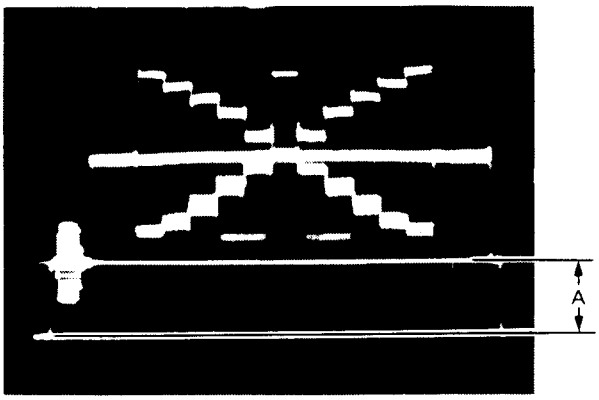


PR-122 BOARD (A SIDE)

4-4-2. SYNC Level Adjustment (EN-72 Board)

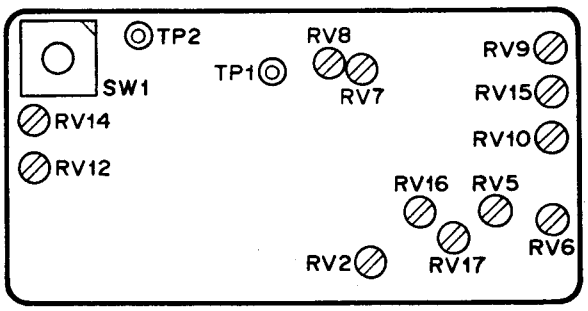
Subject: Grayscale chart
Preparation: ◐RV9/PR-122 board .... counterclockwise full
◐RV16/PR-122 board... clockwise full
◐RV17/PR-122 board... mechanical center
◐RV4/EN-72 board .... clockwise full
◐RV5/EN-72 board .... clockwise full

Adjust:
1. Equipment: Waveform monitor
Test point: VBS OUT
Adj. point: ◐RV7/EN-72 board
Spec.: A = 300 ± 10 mV

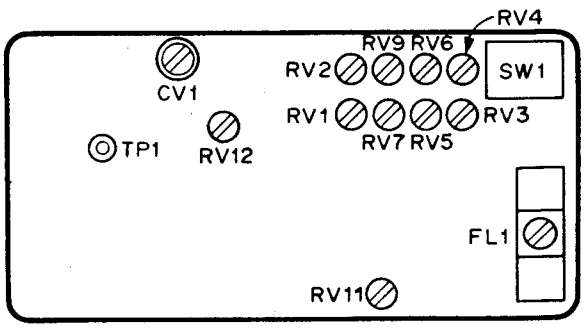


4-4-3. Setup Level Adjustment (EN-72 Board)

Lens iris: Closed "C"
Equipment: Waveform monitor
Test point: VBS OUT
Adj. point: ◐RV6/EN-72 board
Spec.: A = 20 ± 5 mV



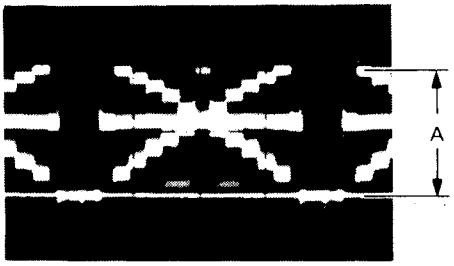
PR-122 BOARD (A SIDE)



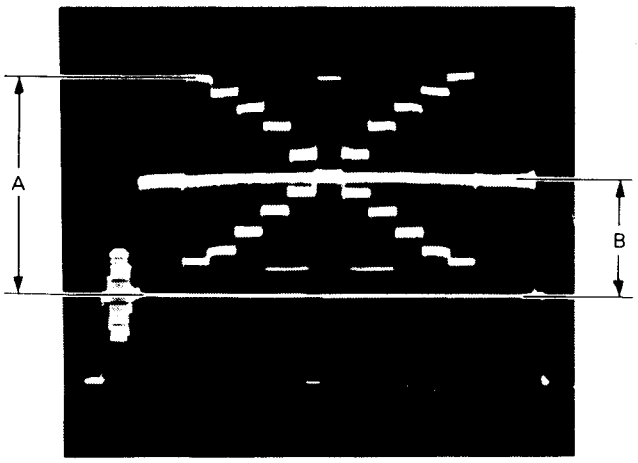
EN-72 BOARD (B SIDE)

4-4-4. Y Level Adjust (EN-72/PR-122 Boards)

Subject: Grayscale chart
Adjust:
1. Equipment: Oscilloscope
   Test point: TP2 (GND: Pin9/Extension board)/PR-122 board
   Adj. point: Lens iris
   Spec.: A = 400 ± 20 mV

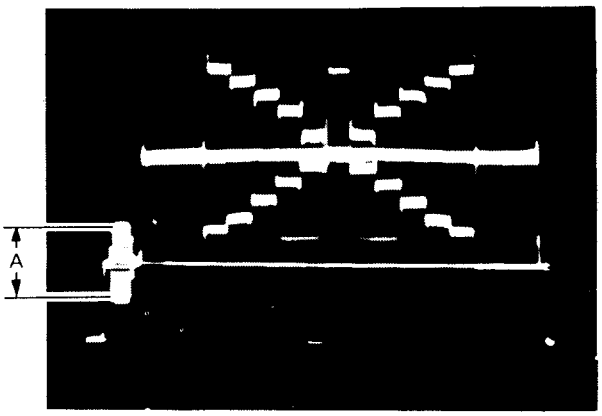


2. Equipment: Waveform monitor
   Preparation: SW1-1/EN-72 board .... "ON"
   Test point: VBS OUT
   Adj. point 1: ◐ RV1/EN-72 board
   Spec. 1: A = 100 ± 2 IRE
   Adj. point 2: ◐ RV17/PR-122 board
   Spec. 2: B = 50 ± 2 IRE
   Repeat adj. point 1 and adj point 2.

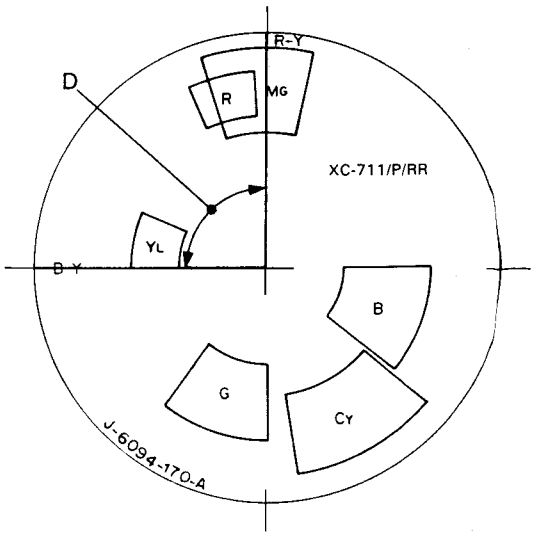


4-4-5. Burst Level Adjustment (EN-72 Board)

Subject: Grayscale chart
Adjust:
1. Equipment: Waveform monitor
   Test point: VBS OUT
   Adj. point: ◐RV11/EN-72 board
   Spec.: A = 300 ± 10 mV



2. Equipment: Vectorscope (GAIN and PHASE modes)
   Test point: VBS OUT
   Adj. point: ◐RV10/EN-72 board
   Spec.: D = 90 ± 0.5°



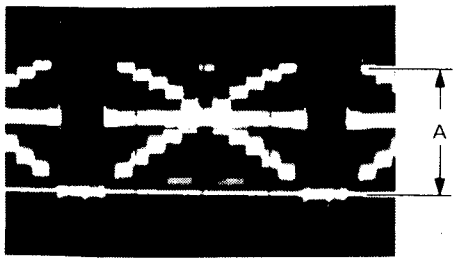
4-4-6. Video Gain Adjustment (YC-38 Board)

Subject: Grayscale chart
Equipment: Oscilloscope
Test point: TP2 (GND: Pin9/Extension board)/PR-122 board
Adjust:

1. Adj. point: Lens iris
   Spec.: A = 250 ± 10 mV

2. Preparation: Mount the YC-38 board to the MB-222 board.
   * Be sure to turn off the power before mounting the PC boards.
   Turn the SW1/YC-38 board and adjust the level of A as follows:

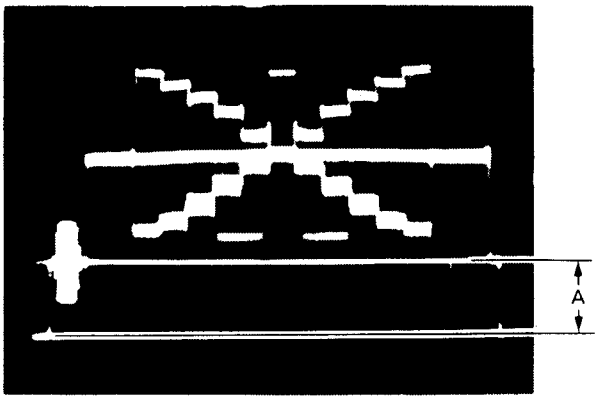
SW1 position	Adjustment point	Specification
"0" (AGC)	◐RV2/PR-122 board	A = 400 ± 20 mV
"1" (-6dB)	◐RV3/YC-38 board	A = 125 ± 10 mV
"2" (0dB)	◐RV4/YC-38 board	A = 250 ± 10 mV
"3" (+6dB)	◐RV5/YC-38 board	A = 500 ± 20 mV
"4" (+12dB)	◐RV6/YC-38 board	A = 1000 ± 40 mV

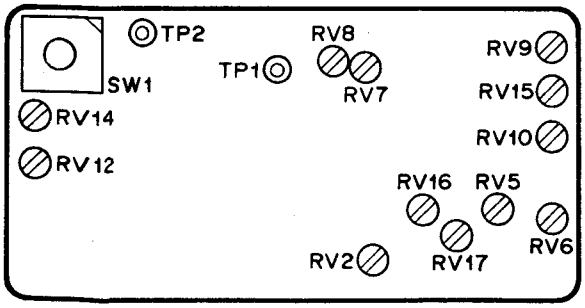


Adjust 1 and 2

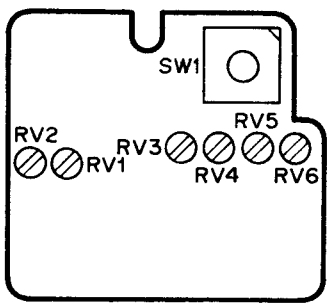
4-4-7. Y Gain Adjustment (YC-38 Board)

Preparation: SW1/YC-38 board .... "2"
Subject: Grayscale chart
Equipment: Waveform monitor
Test point: Cable CCXC-9DB, Y OUT
Adj.point: ◐RV1/YC-38 board
Spec.: A = 300 ± 10 mV





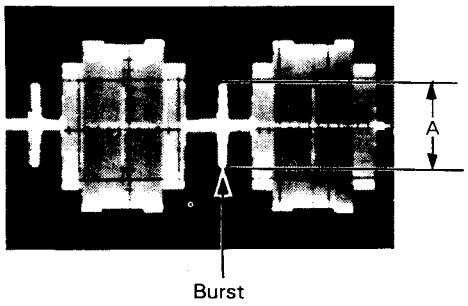
PR-122 BOARD (A SIDE)

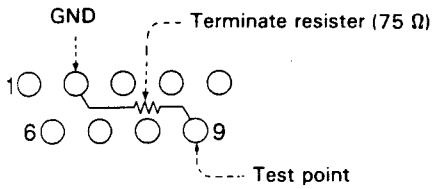


YC-38 BOARD (A SIDE)

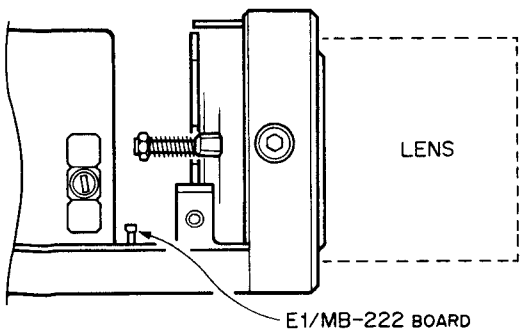
4-4-8. C Gain Adjustment (YC-38 Board)

Preparation: SW1/PR-122 board .... "2"
Subject: Colour-bar chart
Equipment: Oscilloscope (terminated 75 Ω)
Test point: DSUB connector, pin 9
(GND: E1/MB-222 board)
Adj. point: RV2/YC-38 board
Spec.: A = 300 ± 10 mV



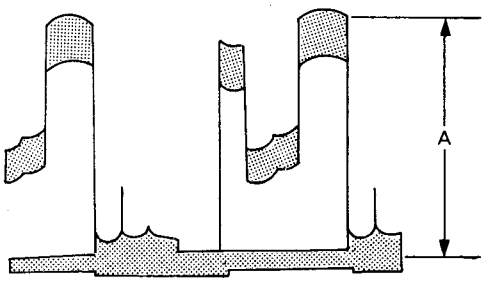


CN-295 board A side
(DSUB connector)

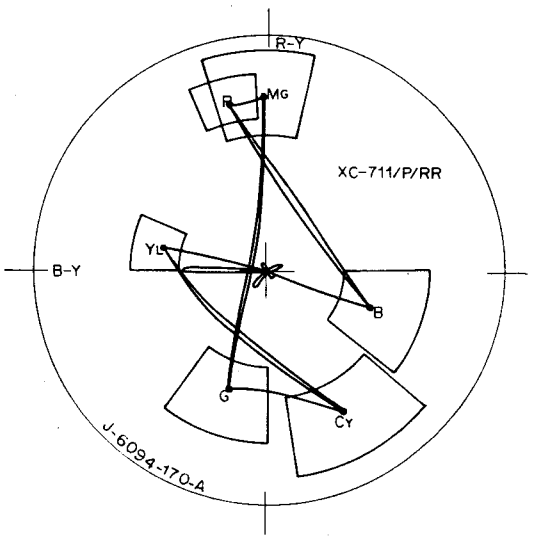


4-4-9. Hue Adjustment (PR-122 Board)

Preparation: SW1/PR-122 board .... "2"
Subject: Colour-bar chart
Adjust:
1. Equipment: Oscilloscope
Test point: TP2 (GND: Pin 9/Extension board)/PR-122 board
Adj. point: Lens iris
Spec.: A = 400 ± 10 mV



2. Equipment: Vectorscope .
Test point: Cable CCXC-9DB, VIDEO OUT
Adj. point 1: ◐RV7, ◐RV8/PR-122 board (alternately adjust)
Spec. 1: White signal spot is at the center of the vectorscope screen.
Adj. point 2: ◐RV5, ◐RV6, ◐RV10, ◐RV15/PR-122 board (alternately adjust)
Spec. 2: The bright sports of R and Y1 have to be inside the specified frame.



4-5. RGB SYSTEM

Preparation:
1. Take the YC-38 board and EN-72 board off the MB-222 board.
2. ◐RV2, ◐RV4, ◐RV7, ◐RV10/RD-14 board
   .... All clockwise full

* Be sure to turn off the power before mounting the PC board.

4-5-1. Setup Level Adjustment (RD-14 Board)

Lens iris: Closed "C"
Equipment: Waveform monitor (EXT SYNC mode)
Adjust:
1. Test point: Cable CCXC-9DB, R OUT
   Adj. point: ◐RV5/RD-14 board
   Spec.: A = 20 ± 5 mV

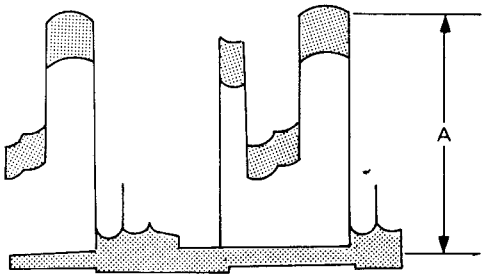
2. Test point: Cable CCXC-9DB, G OUT
   Adj. point: ◐RV8/RD-14 board
   Spec.: A = 20 ± 5 mV

3. Test point: Cable CCXC-9DB, B OUT
   Adj. point: ◐RV11/RD-14 board
   Spec.: A = 20 ± 5 mV

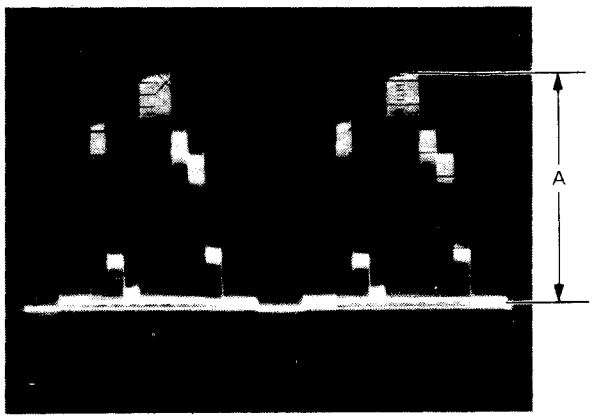
Adjust 1 to 3

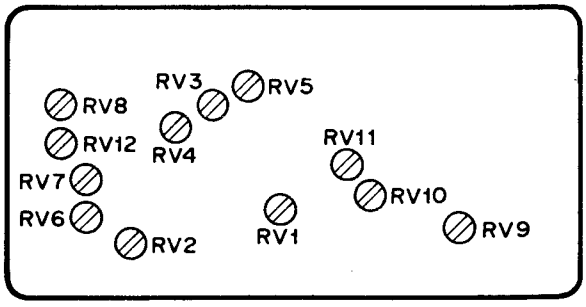
4-5-2. RGB Level Adjustment (RD-14 Board)

Subject: Colour-bar chart
Adjust:
1. Equipment: Oscilloscope
   Test point: TP2 (GND: Pin 9/Extension board)/PR-122 board
   Adj. point: Lens iris
   Spec.: A = 400 ± 10 mV



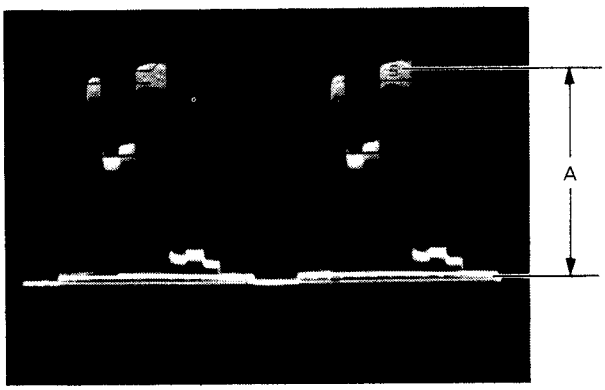
2. Equipment: Waveform monitor
   Test point: Cable CCXC-9DB, R OUT
   Adj. point: ◐RV3/RD-14 board
   Spec.: A = 700 ± 20 mV



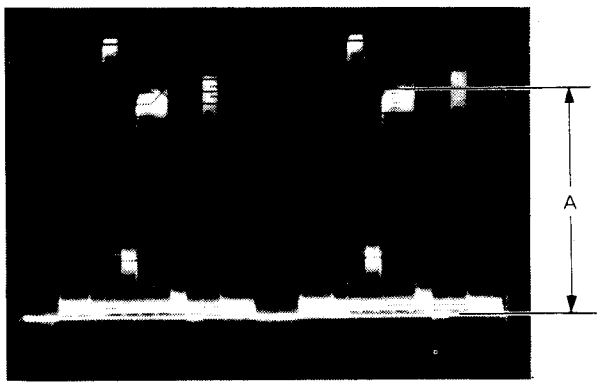


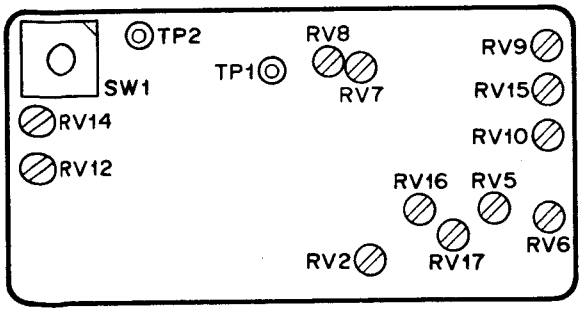
RD-14 BOARD (A SIDE)

3. Equipment: Waveform monitor
   Test point: Cable CCXC-9DB, G OUT
   Adj. point: ◐RV6/RD-14 board
   Spec.: A = 700 ± 20 mV



4. Equipment: Waveform monitor
   Test point: Cable CCXC-9DB, B OUT
   Adj. point: ◐RV9/RD-14 board
   Spec.: A = 700 ± 20 mV





PR-122 BOARD (A SIDE)

4-5-3. Aperture Adjustment (RD-14 Board)

Subject: Inmega chart
Equipment: Waveform monitor (15 LINE mode)
Test point: Cable CCXC-9DB, G OUT
Adjust:

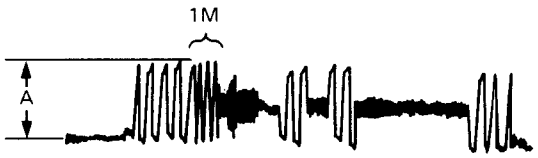
1. Adj. point: Lens iris
   Spec.: 0.5 MHz level A = 280 ± 14 mV

2. Preparation: ◐RV2/RD-14 board
   .... counterclockwise full
   Adj. point: ◐RV1/RD-14 board
   Spec.: 1 MHz level A = 560 ± 14 mV

3. Adj. point: ◐RV2/RD-14 board
   Spec.: 1 MHz level A = 315 ± 14 mV

4. Adj. point: ◐RV1/RD-14 board
   Spec.: 1 MHz level A = 400 ± 14 mV

5. Adj. point: ◐RV9/PR-122 board
   Spec.: 1 MHz level A = 385 ± 14 mV



Adjust 2 to 5

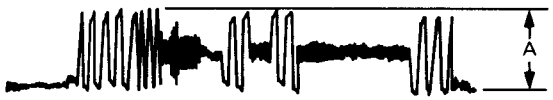
4-5-4. White Clip Adjustment (RD-14 Board)

Subject: Inmega chart
Lens iris: Open
Equipment: Waveform monitor
Adjust:

1. Test point: Cable CCXC-9DB, G OUT
   Adj. point: ◐RV7/RD-14 board
   Spec.: A = 770 ± 20 mV

2. Test point: Cable CCXC-9DB, R OUT
   Adj. point: ◐RV4/RD-14 board
   Spec.: A = 770 ± 20 mV

3. Test point: Cable CCXC-9DB, B OUT
   Adj. point: ◐RV10/RD-14 board
   Spec.: A = 770 ± 20 mV



Adjust 1 to 3

4-6. VBS SYSTEM

Preparation:

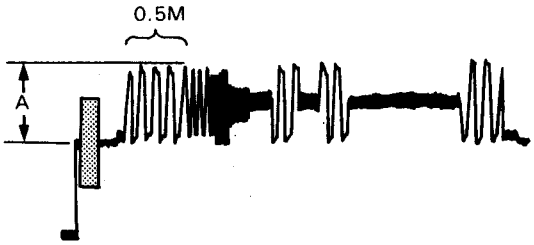
1. Remove the solder of the "C-OUT" pattern jumper of the EN-72 board that had been removed, and open it.
2. Mount the EN-72 board and the YC-38 board to the MB-222 board.
3. Insert the shield board that had been removed, between the EN-72 board and the RD-14 board.

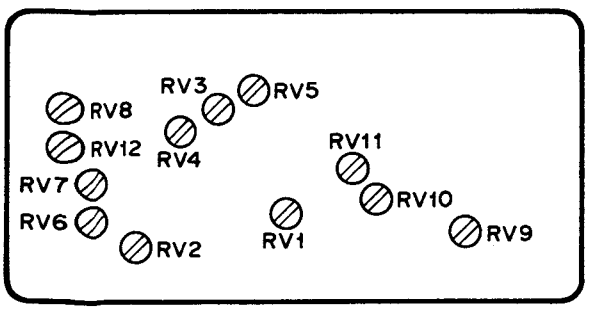
* Be sure to turn off the power before mounting the PC boards.

4-6-1. Aperture Adjustment (EN-72 Board)

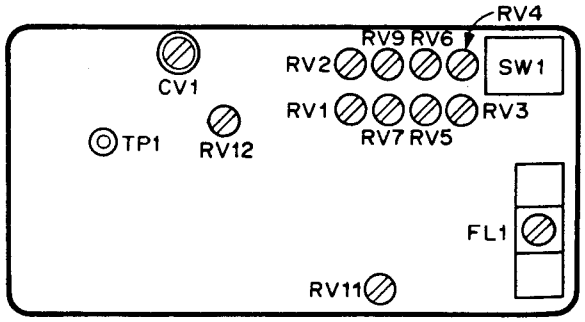
Subject: Inmega chart
Equipment: Waveform monitor
Test point: Cable CCXC-9DB, VIDEO OUT
Adjust:

1. Adj. point: Lens iris
   Spec.: 0.5 MHz level A = 350 ± 14 mV





RD-14 BOARD (A SIDE)



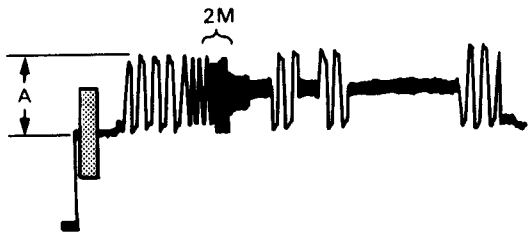
EN-72 BOARD (B SIDE)

2. Preparation: ◐RV4/EN-72 board
.... counterclockwise full
Adj. point: ◐RV3/EN-72 board
Spec.: 2 MHz level A = 560 ± 14 mV

3. Adj. point: ◐RV4/EN-72 board
Spec.: 2 MHz level A = 350 ± 14 mV

4. Adj. point: ◐RV3/EN-72 board
Spec.: 2 MHz level A = 400 ± 14 mV

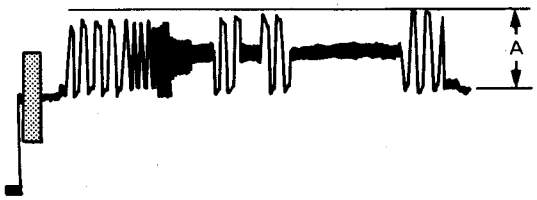
5. Adj. point: ◐RV16/PR-122 board
Spec.: 2 MHz level A = 385 ± 14 mV

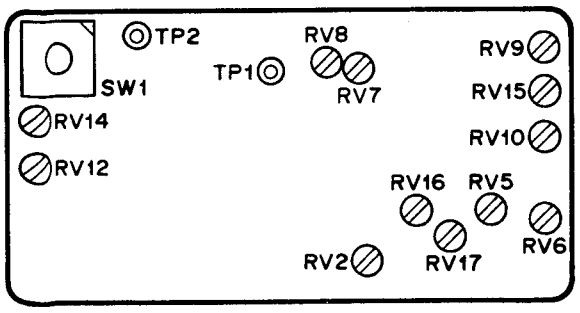


Adjust 2 to 5

4-6-2. White Clip Adjustment (EN-72 Board)

Subject: Inmega chart
Lens iris: Open
Equipment: Waveform monitor
Test point: Cable CCXC-9DB, VIDEO OUT
Adj. point: ◐RV5/EN-72 board
Spec.: A = 770 ± 20 mV



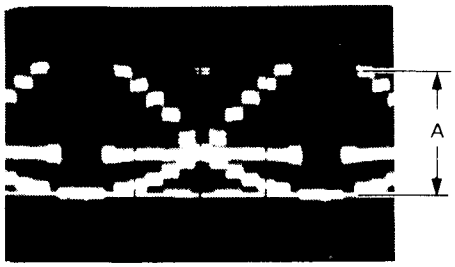


PR-122 BOARD (A SIDE)

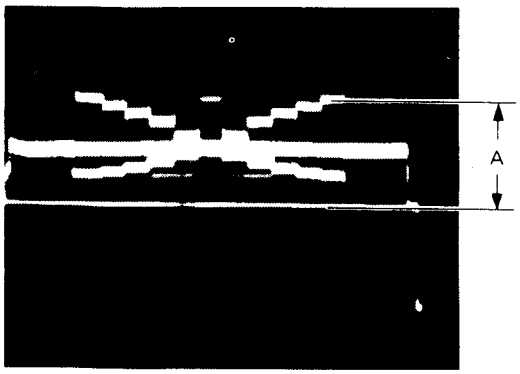
4-6-3. Chroma Level Adjustment (EN-72 Board)

Subject: Grayscale chart
Adjust:

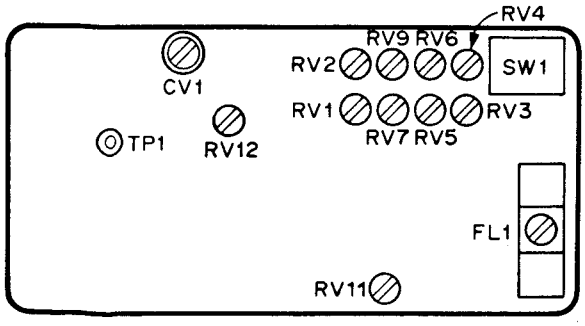
1. Equipment: Waveform monitor
   Test point: Cable CCXC-9DB, G OUT
   Adj. point: Lens iris
   Spec.: A = 700 ± 14 mV



2. Preparation: SW1/PR-122 board .... "A"
   Equipment: Waveform monitor
   Test point: Cable CCXC-9DB, G OUT
   Adj. point: ◐ RV9/EN-72 board
   Spec.: A = 700 ± 14 mV



3. Confirmation: Turn the SW1-1/EN-72 board to "ON"/ "OFF" and confirm that the level of A is not changes.

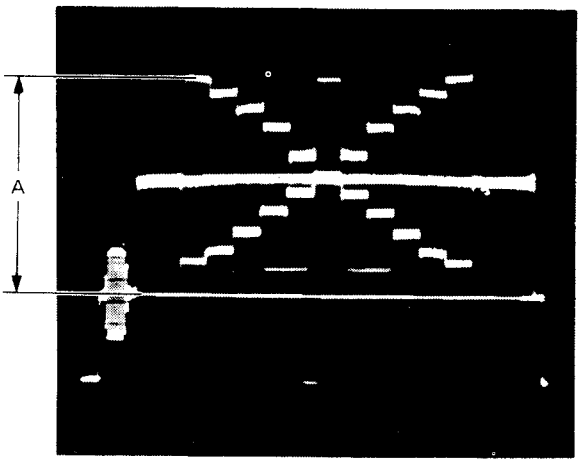


EN-72 BOARD (B SIDE)

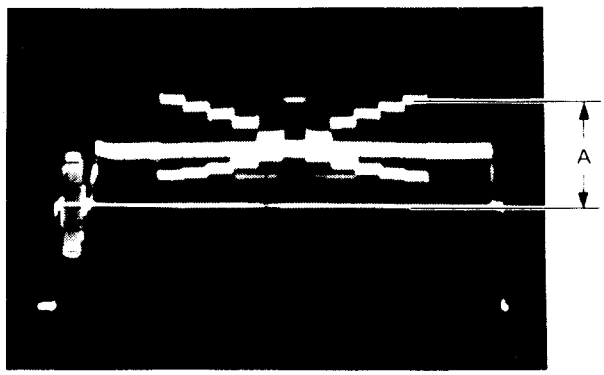
4-6-4. VBS Level Adjustment (EN-72 Board)

Subject: Grayscale chart
Adjust:

1. Preparation: SW1-1/EN-72 board .... "ON"
   Equipment: Waveform monitor
   Test point: Cable CCXC-9DB, VIDEO OUT
   Adj. point: Lens iris
   Spec.: A = 700 ± 14 mV



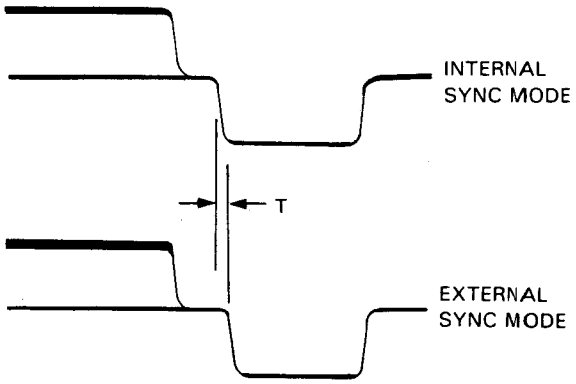
2. Preparation: SW1-1/EN-72 board .... "OFF"
   Equipment: Waveform monitor
   Test point: Cable CCXC-9DB, VIDEO OUT
   Adj. point: ◐RV2/EN-72 board
   Spec.: A = 700 ± 14 mV



3. Confirmation: Turn the SW1-1/EN-72 board to "ON", and confirm that the level of A is not changes.

4-6-5. SYNC Phase Adjustment (EN-72 board)

Subject: Grayscale monitor
Equipment: Waveform monitor (Measuring is performed by switching the waveform monitor between internal and external SYNC signals.)
Test point: Cable CCXC-9D, VIDEO OUT
Adj. point: ◐ RV12/EN-72 board (external)
Spec.: T ≦ 100 ns



4-7. WHITE BALANCE SYSTEM (MD-61 Board)

Preparation:

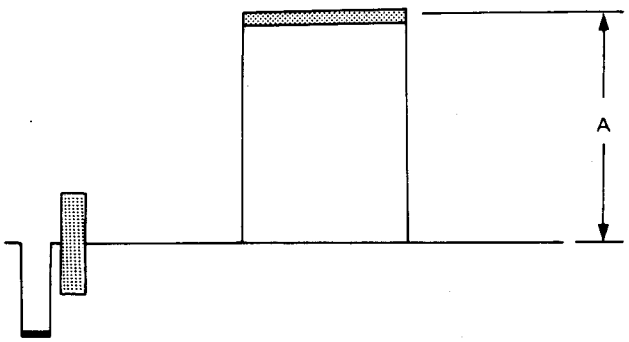
1. Remove the PC boards from the MB-222 board in the following order: DR-83 board, TG-48 board, PR-122 board and extension board.
2. Remount the PR-122 board to the MB-222 board.
3. Remount the TG-48 board to the MB-222 board, pulling the harness of the PR-122 board toward the front so that it is not pressed under the PC board.
4. Remount the DR-83 board to the MB-222 board.

* Be sure to turn off the power before removing and remounting the PC boards.

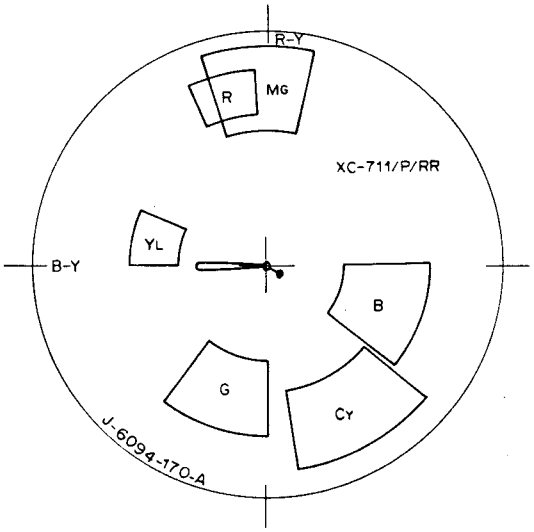
4-7-1. Colour Temperature Adjustment (5600°K)

Subject: White window chart
Preparation: Cover the lens with a LB140 filter
SW1-1/EN-72 board .... "ON"
SW1-2/EN-72 board .... "OFF"
SW1-3/EN-72 board .... "ON"
Adjust:

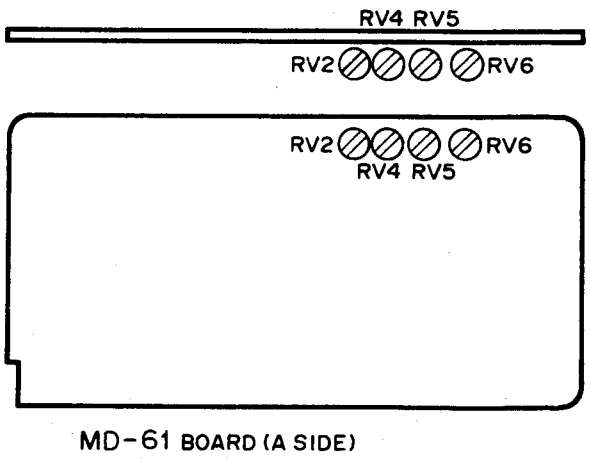
1. Equipment: Waveform monitor
   Test point: Cable CCXC-9DB, VIDEO OUT
   Adj. point: Lens iris
   Spec.: A = 630 ± 20 mV



2. Equipment: Vectorscope
   Test point: Cable CCXC-9DB, VIDEO OUT
   Adj. point: ◐RV5, ◐RV6/MD-61 board (alternately adjust)
   Spec.: The bright spot is at the center of the vectorscope screen.



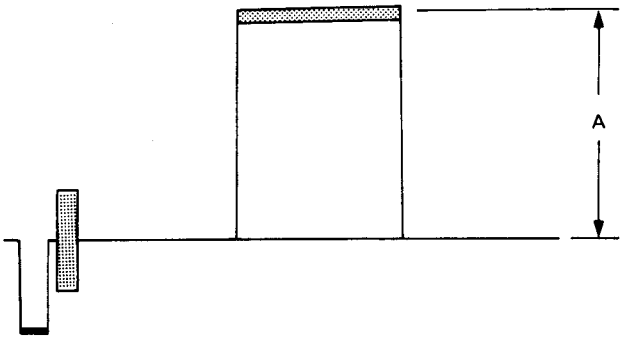
NOTE: Remove the LB140 filter from the lens after adjustment.



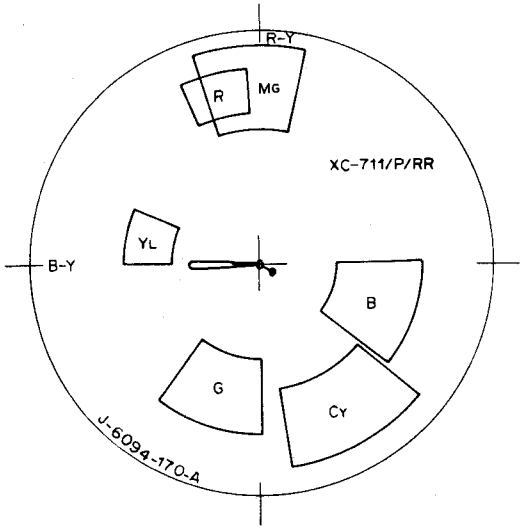
MD-61 BOARD (A SIDE)

4-7-2. Auto White Balance Offset Adjustment

Subject: White window chart
Preparation: SW1-2/EN-72 board .... "ON"
Adjust:
1. Equipment: Waveform monitor
   Test point: Cable CCXC-9DB, VIDEO OUT
   Adj. point: Lens iris
   Spec.: A = 350 ± 14 mV

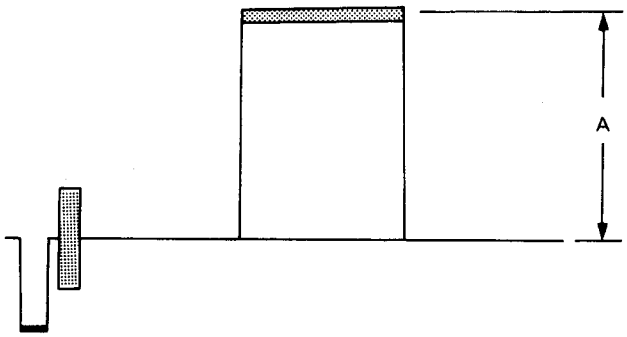


2. Equipment: Vectorscope
   Test point: Cable CCXC-9DB, VIDEO OUT
   Adj. point: ◐RV2, ◐RV4/MD-61 board (alternately adjust)
   Spec.: The bright spot is at the center of the vectorscope screen.

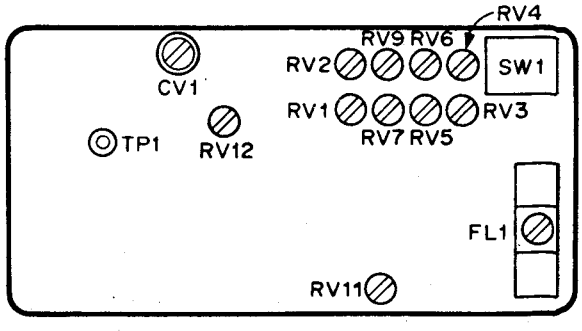


4-7-3. Auto White Balance Mode Check

Subject: White window chart
Preparation:
1. SW1-2/EN-72 board .... "OFF"
2. Cover the lens with a LB200 filter
Adjust: Equipment: Waveform monitor
   Test point: Cable CCXC-9DB, VIDEO OUT
   Adj. point: Lens iris
   Spec.: A = 350 ± 14 mV



Configuration: Equipment: Vectorscope
   Test point: Cable CCXC-9DB, VIDEO OUT
   Config. point: Bright spot position.
   Spec.: When the SW1-2/EN-72 board is set to ON, the bright spot moves to the center of the vectorscope screen.

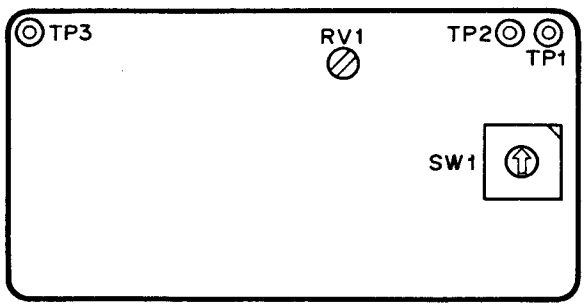


EN-72 BOARD (B SIDE)

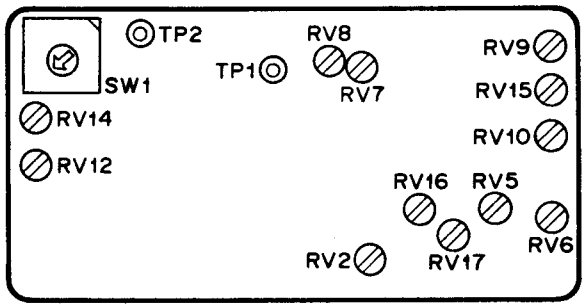
4-8. SWITCH SETTING

The switches are factory-set as follows.

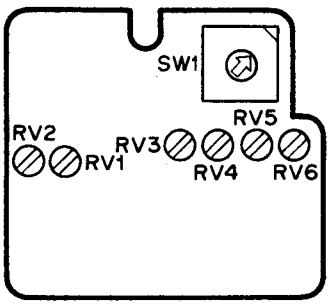
- DR-83 board, SW1 ....."0"
- PR-122 board, SW1 ..."A"
- YC-38 board, SW1 ....."2"
- EN-72 board, SW1-1 .."ON"
  -2 .."OFF"
  -3 .."OFF"
  -4 .."OFF"



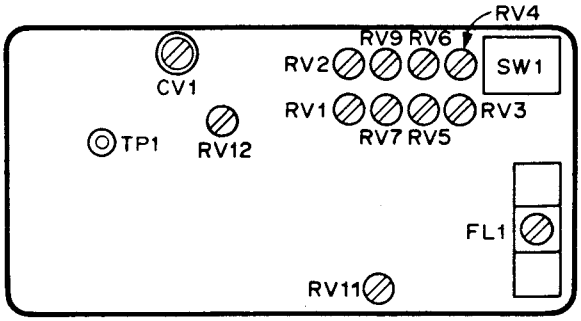
DR-83 BOARD (B SIDE)



PR-122 BOARD (A SIDE)



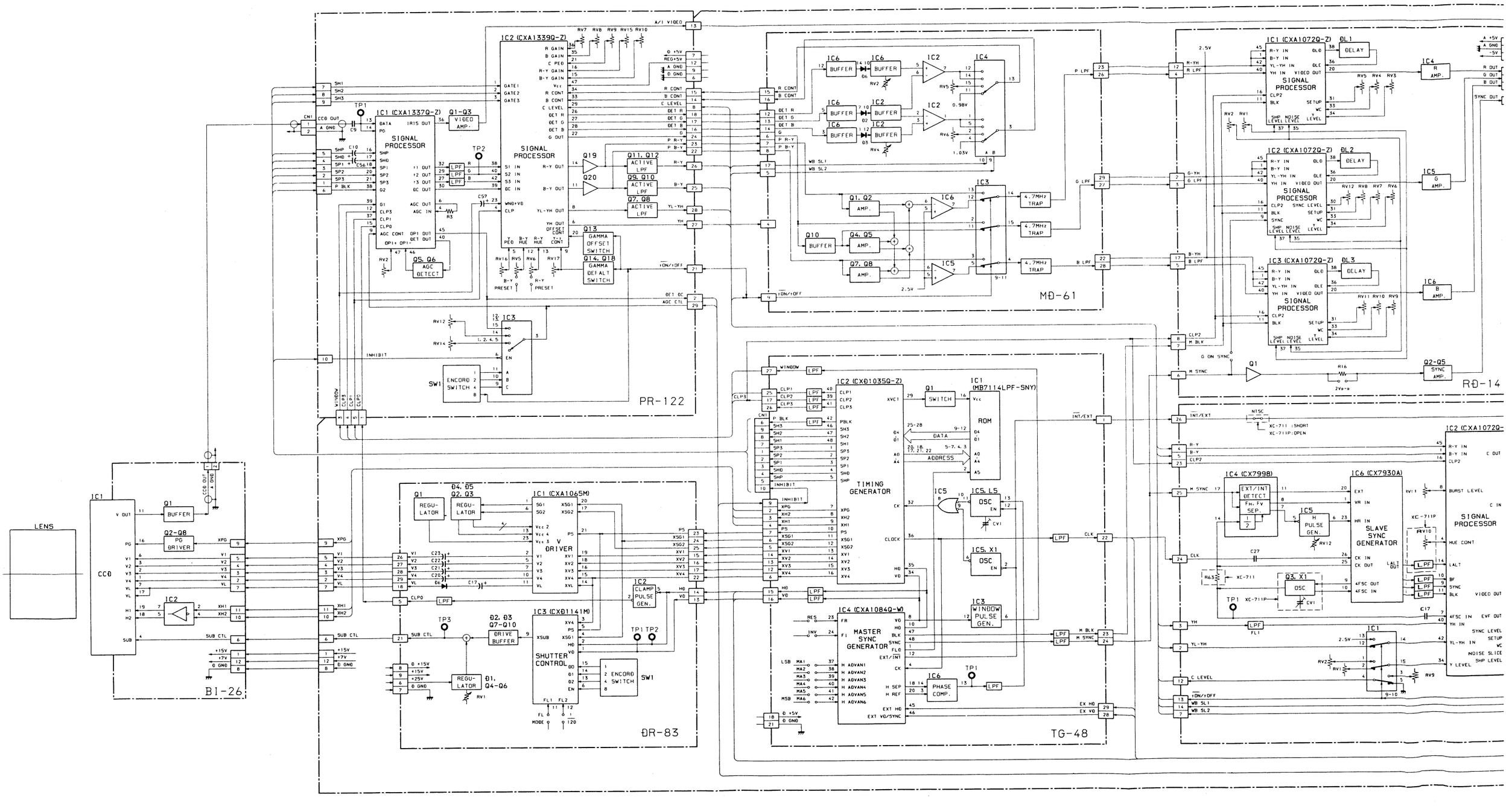
YC-38 BOARD (A SIDE)



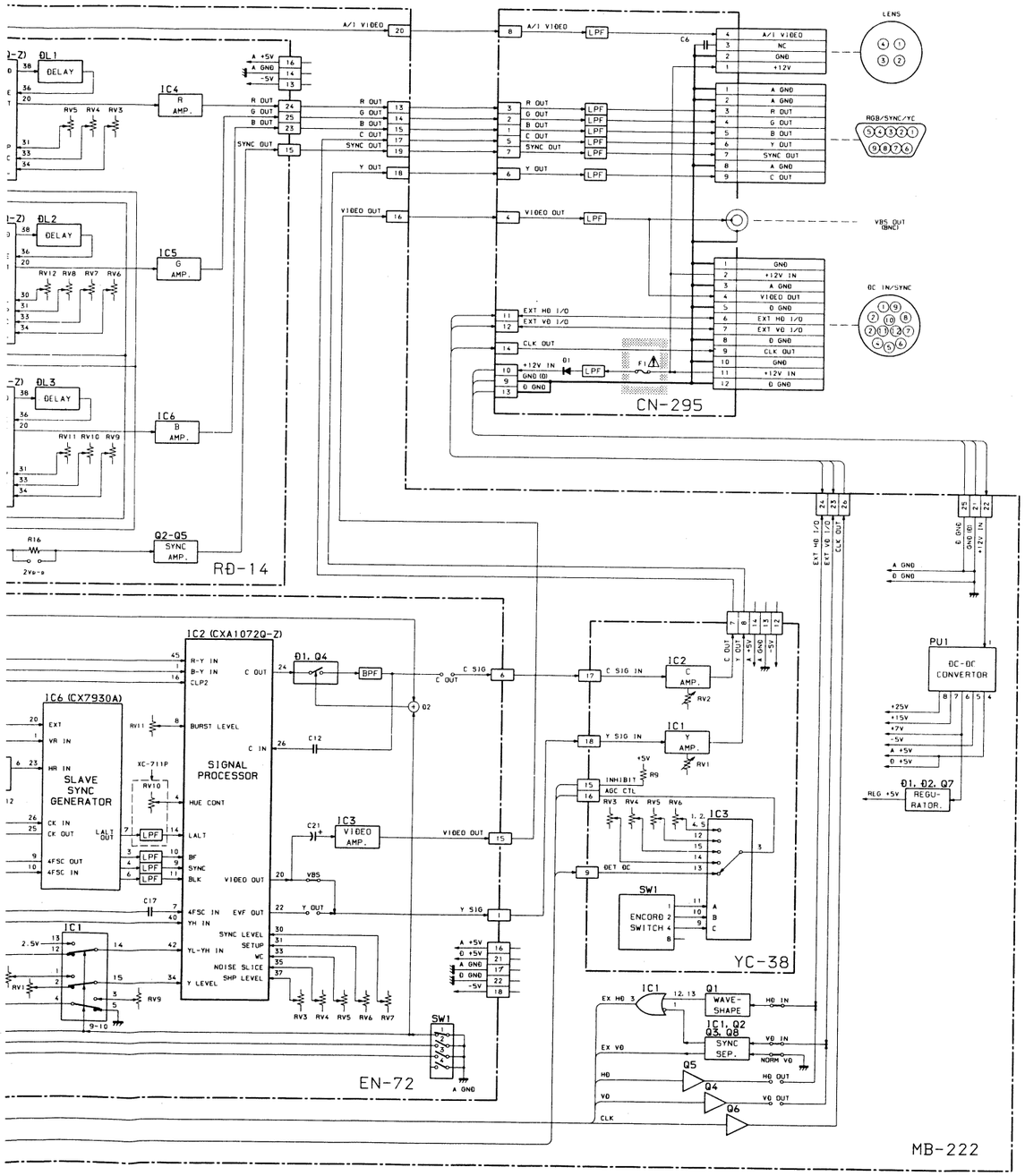
EN-72 BOARD (B SIDE)

SECTION A
DIAGRAM

A-1. BLOCK DIAGRAM



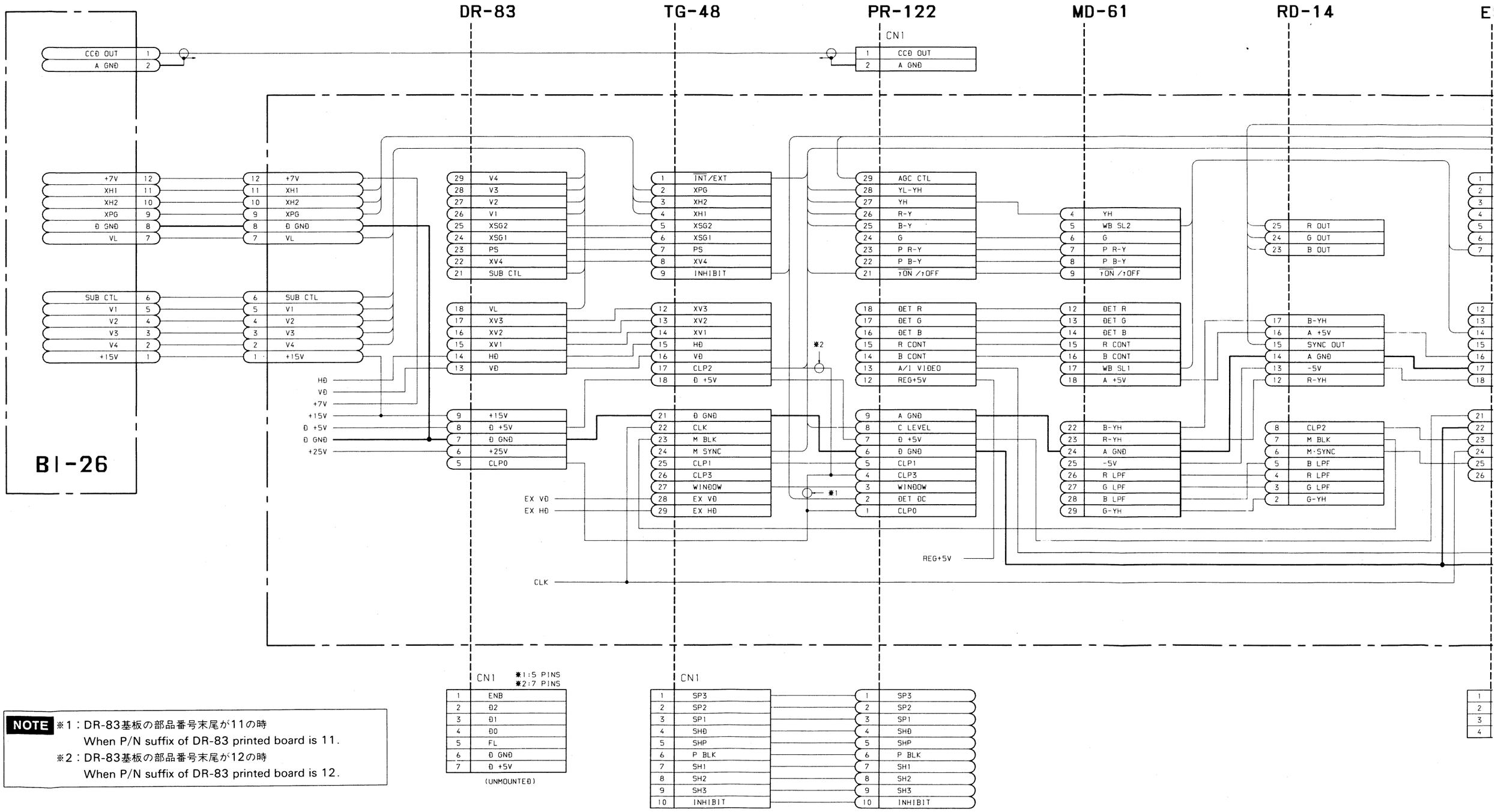
XC-711 (UCJ)
XC-711P (EK)



OVERALL BLOCK
XC-711 (UC/J)
XC-711P (EK)

A-2. SCHEMATIC AND MOUNTING DIAGRAM

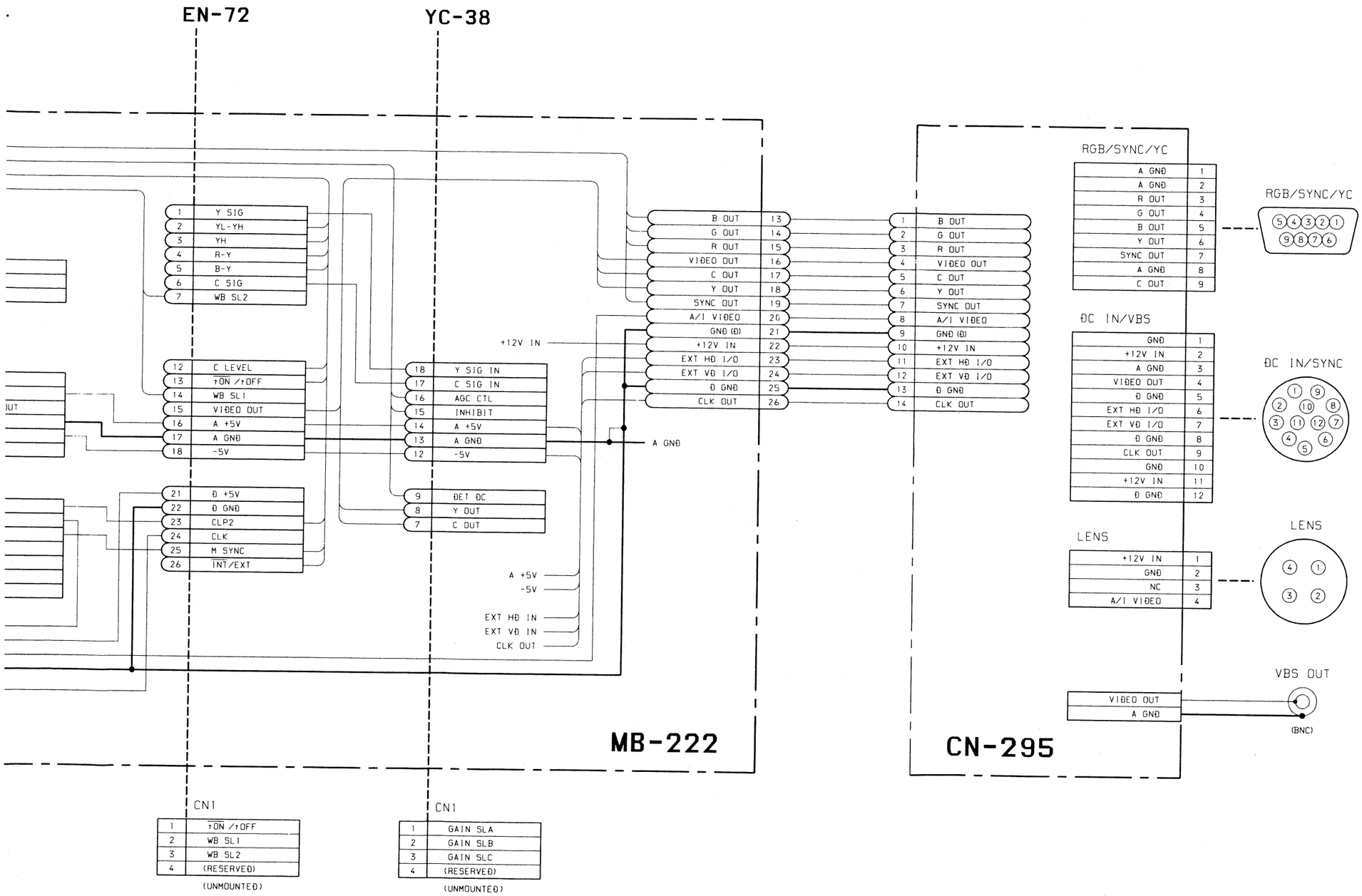
FRAME



B1-26

NOTE ※1：DR-83基板の部品番号末尾が11の時
When P/N suffix of DR-83 printed board is 11.
※2：DR-83基板の部品番号末尾が12の時
When P/N suffix of DR-83 printed board is 12.

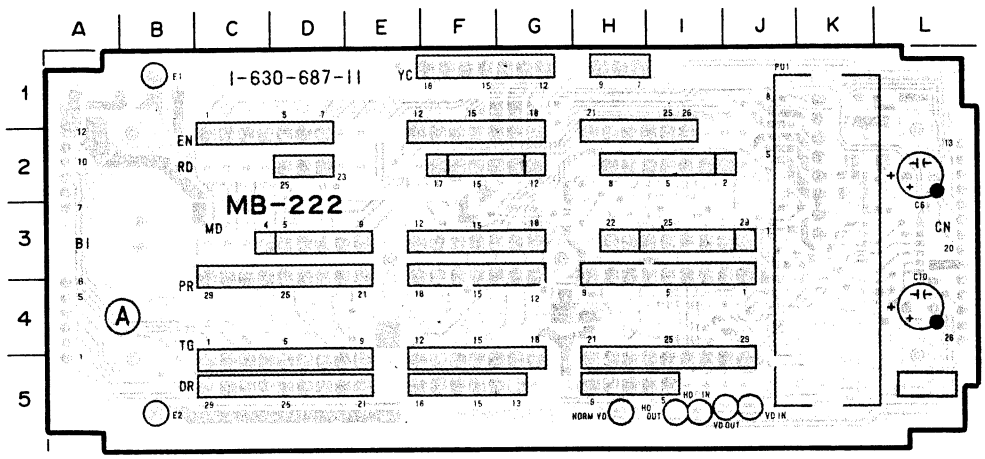
FRAME	XC-711/P	XC-711/P	FRAME



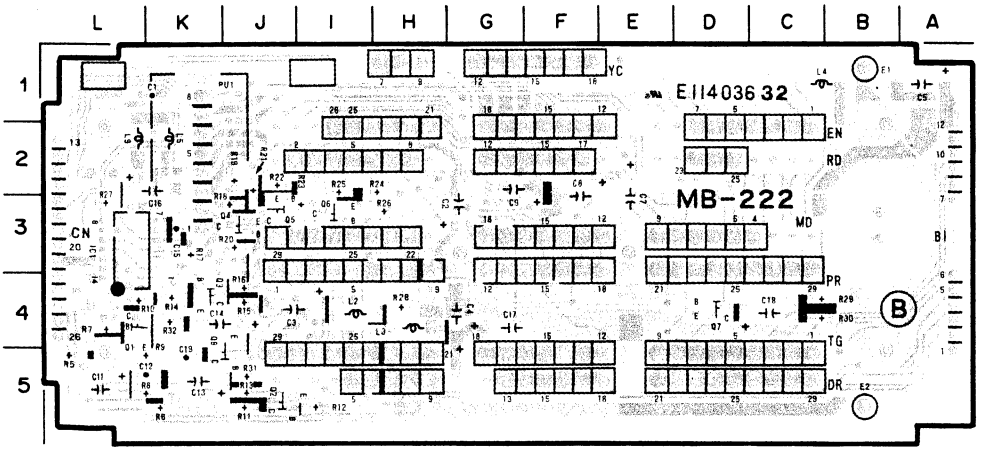
FRAME DIAGRAM

XC-711 (UCJ)
XC-711P (EK)

MB-222 Board



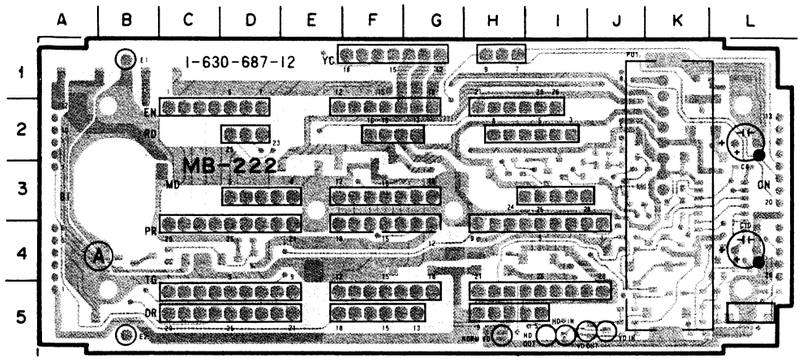
MB-222 —A SIDE—
1-630-687-11
XC-711 (UCJ)
XC-711P (EK)



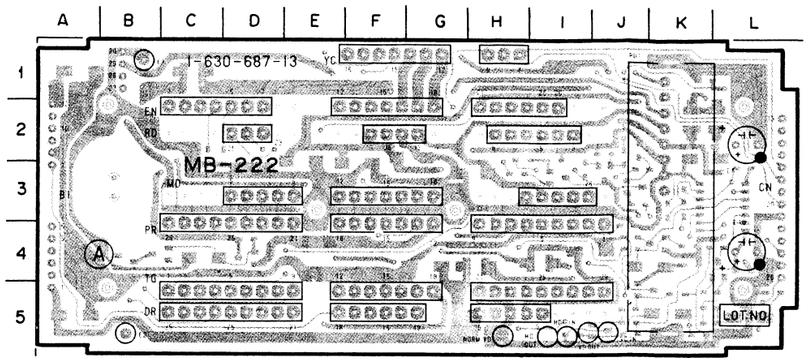
MB-222 —B SIDE—
1-630-687-11
XC-711 (UCJ)
XC-711P (EK)

*C1	K-1	E1	B-1	*Q7	D-4	*R21	J -2	HD IN	I -5
*C2	G-3	E2	B-5	*Q8	J -5	*R22	J -2	HD OUT	I -5
*C3	J -4					*R23	I -3	NORM VD	H-5
*C4	G-4	*IC1	L -3	*R5	L -5	*R24	H -3	VD IN	J -5
*C5	A-1			*R6	K -5	*R25	I -3	VD OUT	I -5
C6	L -2	*L2	I -4	*R7	L -4	*R26	H -3		
*C7	E -3	*L3	H-4	*R8	K -5	*R27	L -3		
*C8	F -3	*L4	C-1	*R9	K -5	*R28	H -4		
*C9	G-3	*L5	K-2	*R10	L -4	*R29	B -4		
C10	L -4	*L9	L -2	*R11	J -5	*R30	B -4		
*C11	L -5			*R12	I -5	*R31	J -5		
*C12	K-5	PU1	J -1	*R13	J -5	*R32	K -4		
*C13	K-5			*R14	K -4				
*C14	J -4	*Q1	L -4	*R15	J -4				
*C15	K-3	*Q2	J -5	*R16	J -4				
*C16	K-3	*Q3	K-4	*R17	K -3				
*C17	G-4	*Q4	J -3	*R18	J -3				
*C18	C-4	*Q5	J -3	*R19	J -2				
*C19	K-5	*Q6	I -3	*R20	J -3				

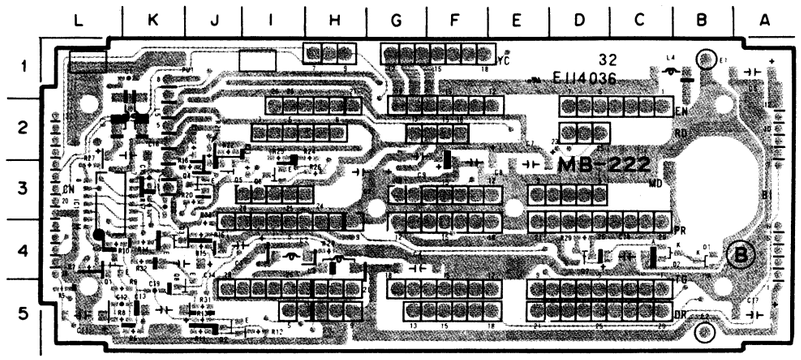
*; B SIDE



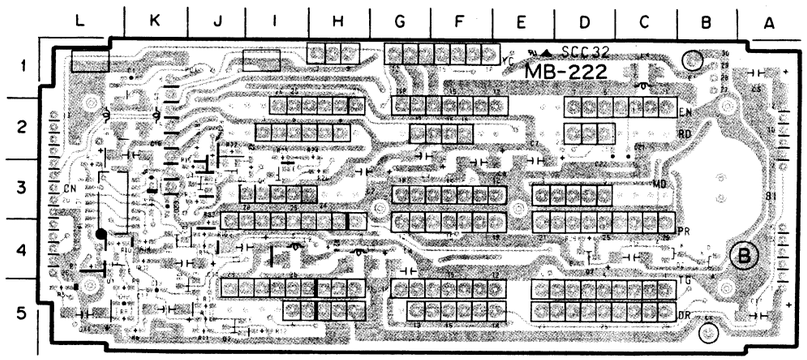
MB-222 –A SIDE–
1-630-687-12
XC-711 (UCJ)
XC-711P (EK)
XC-711RR (UCJ)



MB-222 –A SIDE–
1-630-687-13
XC-711 (UCJ)
XC-711P (EK)
XC-711RR (UCJ)



MB-222 –B SIDE–
1-630-687-12
XC-711 (UCJ)
XC-711P (EK)
XC-711RR (UCJ)



MB-222 –B SIDE–
1-630-687-13
XC-711 (UCJ)
XC-711P (EK)
XC-711RR (UCJ)

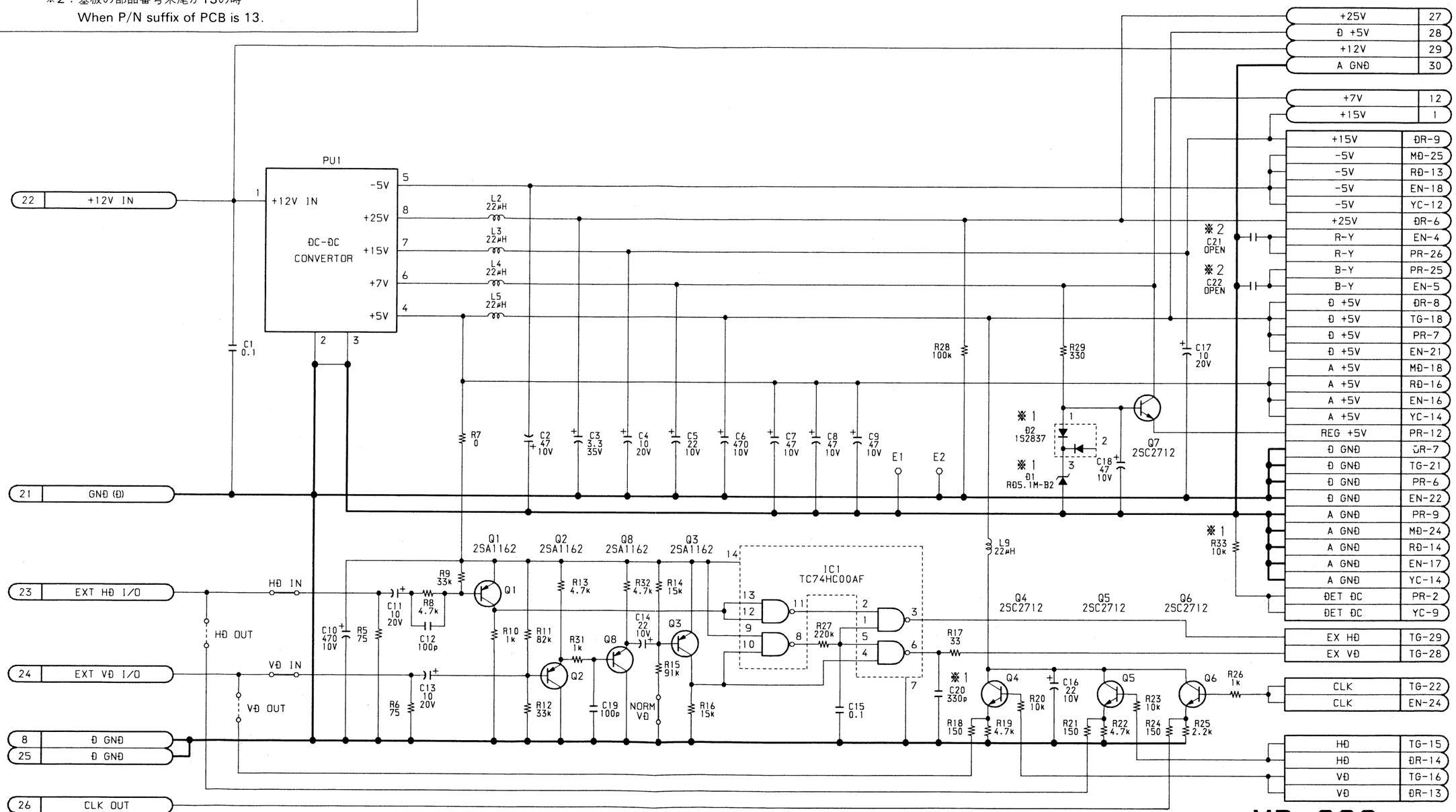
*C1	K-1	*C20	K-3	*Q1	L-4	*R15	J -4	HD IN	I -5
*C2	H-3			*Q2	J-5	*R16	J -4	HD OUT	I -5
*C3	J -4	*D1	B-4	*Q3	K-4	*R17	K -3	NORM VD	H-5
*C4	G-4	*D2	C-4	*Q4	J-3	*R18	J -3	VD IN	J -5
*C5	A-1			*Q5	J-3	*R19	J -2	VD OUT	I -5
C6	L -2	E1	B-1	*Q6	I -3	*R20	J -3		
*C7	E-3	E2	B-5	*Q7	D-4	*R21	J -2		
*C8	F-3			*Q8	J-5	*R22	J -2		
*C9	G-3	*IC1	L -3			*R23	I -3		
C10	L -4			*R5	L-5	*R24	H -3		
*C11	L -5	*L2	I -4	*R6	K-5	*R25	I -3		
*C12	K-5	*L3	H-4	*R7	L-4	*R26	H -3		
*C13	K-5	*L4	C-1	*R8	K-5	*R27	L -3		
*C14	J -4	*L5	K-2	*R9	K-5	*R28	H -4		
*C15	K-3	*L9	L -2	*R10	L-4	*R29	D -4		
*C16	K-3			*R11	J-5	*R31	J -5		
*C17	A-5	PU1	J -1	*R12	I -5	*R32	K -4		
*C18	C-4			*R13	J-5	*R33	J -4		
*C19	K-5			*R14	K-4				

*; B SIDE

*C1	K-1	*C20	K-3	*Q1	L-4	*R15	J -4	HD IN	I -5
*C2	H-3	*C21	C-2	*Q2	J-5	*R16	J -4	HD OUT	I -5
*C3	J -4	*C22	D-2	*Q3	K-4	*R17	K -3	NORM VD	H-5
*C4	G-4			*Q4	J-3	*R18	J -3	VD IN	J -5
*C5	A-1	*D1	B-4	*Q5	J-3	*R19	J -2	VD OUT	I -5
C6	L -2	*D2	C-4	*Q6	I -3	*R20	J -3		
*C7	E-3			*Q7	D-4	*R21	J -2		
*C8	F-3	E1	B-1	*Q8	J-5	*R22	J -2		
*C9	G-3	E2	B-5			*R23	I -3		
C10	L -4			*R5	L-5	*R24	H -3		
*C11	L -5	*IC1	L -3	*R6	K-5	*R25	I -3		
*C12	K-5			*R7	L-4	*R26	H -3		
*C13	K-5	*L2	I -4	*R8	K-5	*R27	L -3		
*C14	J -4	*L3	H-4	*R9	K-5	*R28	H -4		
*C15	K-3	*L4	C-1	*R10	L-4	*R29	D -4		
*C16	K-3	*L5	K-2	*R11	J-5	*R31	J -5		
*C17	A-5	*L9	L -2	*R12	I -5	*R32	K -4		
*C18	C-4			*R13	J-5	*R33	J -4		
*C19	K-5	PU1	J -1	*R14	K-4				

*; B SIDE

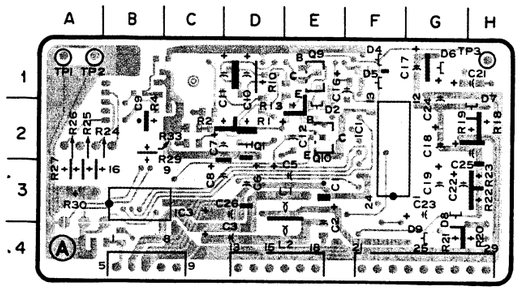
NOTE ※1：基板の部品番号末尾が11の場合に後付けした部品です。
These are tentative aftercare parts in P/N suffix-11 of PCB.
※2：基板の部品番号末尾が13の時
When P/N suffix of PCB is 13.



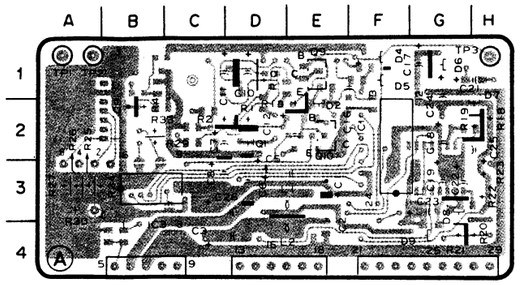
MB-222

1-630-687-11, 12, 13
XC-711 (UCJ)
XC-711P (EK)

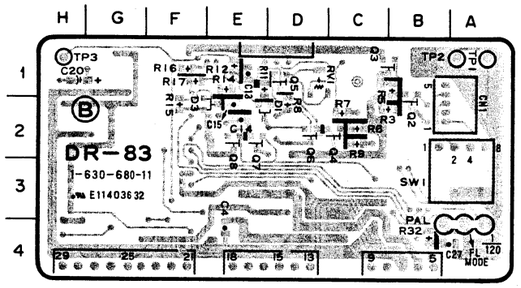
DR-83 Board



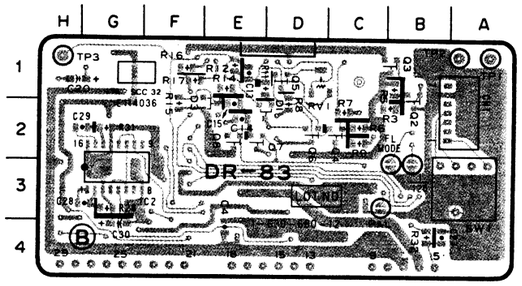
DR-83 —A SIDE—
1-630-680-11
XC-711 (UCJ)
XC-711P (EK)



DR-83 —A SIDE—
1-630-680-12
XC-711 (UCJ)
XC-711P (EK)
XC-711RR (UCJ)



DR-83 —B SIDE—
1-630-680-11
XC-711 (UCJ)
XC-711P (EK)

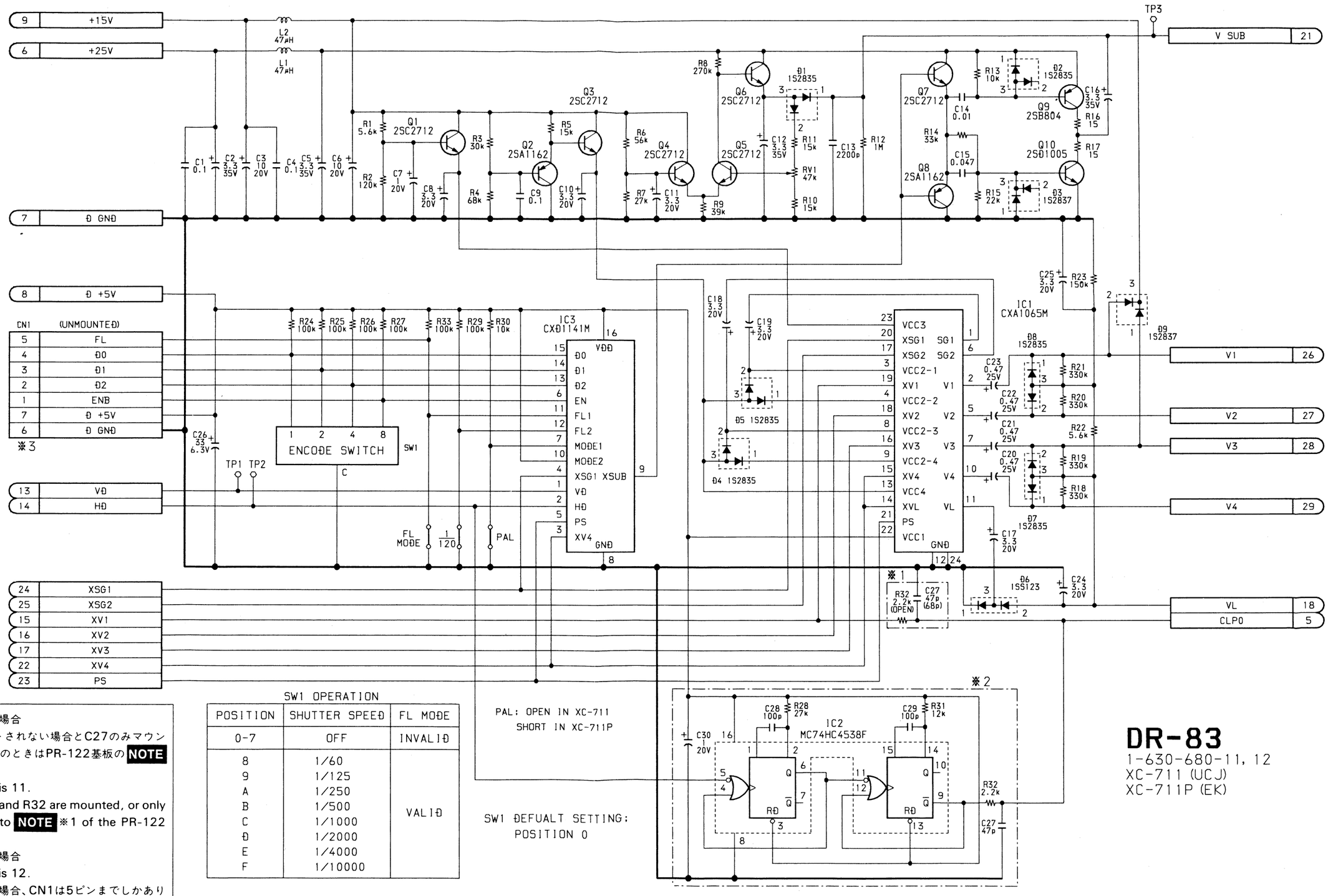


DR-83 —B SIDE—
1-630-680-12
XC-711 (UCJ)
XC-711P (EK)
XC-711RR (UCJ)

C1	E-3	C25	H-2	*Q3	B-1	*R16	F-1	*FL MODE	A-4
C2	E-4	C26	D-3	*Q4	C-2	*R17	F-1	*PAL	B-4
C3	D-4	*C27	A-4	*Q5	D-1	R18	H-2	*1/120	A-4
*C4	E-4			*Q6	D-2	R19	H-2		
C5	E-3	*CN1	A-2	*Q7	E-2	R20	H-4		
C6	D-3			*Q8	E-2	R21	G-4		
C7	C-2	*D1	D-2	Q9	E-1	R22	H-3		
C8	C-3	D2	E-2	Q10	E-2	R23	H-3		
C9	B-2	*D3	E-2			R24	A-3		
C10	D-1	D4	F-1	R1	D-2	R25	A-3		
C11	C-1	D5	F-1	R2	C-2	R26	A-3		
C12	E-2	D6	G-1	*R3	B-2	R27	A-3		
*C13	E-1	D7	H-2	R4	B-2	R29	B-2		
*C14	E-2	D8	G-3	*R5	B-1	R30	A-3		
*C15	E-2	D9	G-4	*R6	C-2	*R32	B-4		
C16	E-1			*R7	C-2	R33	B-2		
C17	G-1	IC1	F-2	*R8	D-2				
C18	G-2	IC3	B-3	*R9	C-2	*RV1	D-1		
C19	G-3			R10	D-1				
*C20	H-1	L1	E-3	*R11	D-1	*SW1	B-3		
C21	H-1	L2	E-4	*R12	E-1				
C22	G-3			R13	E-2	TP1	A-1		
C23	G-3	Q1	D-2	*R14	E-1	TP2	A-1		
C24	G-1	*Q2	B-2	*R15	F-2	TP3	H-1	*; B SIDE	

C1	E-3	*C27	A-4	*Q3	B-1	R18	H-2	*FL MODE	B-3
C2	E-4	*C28	G-3	*Q4	C-2	R19	H-2	*PAL	C-3
C3	D-4	*C29	G-2	*Q5	D-1	R20	H-4	*1/120	B-3
*C4	E-4	*C30	G-4	*Q6	D-2	R21	G-4		
C5	E-3			*Q7	E-2	R22	H-3		
C6	D-3	*CN1	A-2	*Q8	E-2	R23	H-3		
C7	C-2			Q9	E-1	R24	A-3		
C8	C-3	*D1	D-2	Q10	E-2	R25	A-3		
C9	B-2	D2	E-2			R26	A-3		
C10	D-1	*D3	E-2	R1	D-2	R27	A-3		
C11	C-1	D4	F-1	R2	C-2	*R28	G-3		
C12	E-2	D5	F-1	*R3	B-2	R29	B-2		
*C13	E-1	D6	G-1	R4	B-2	R30	A-3		
*C14	E-2	D7	H-2	*R5	B-1	*R31	G-2		
*C15	E-2	D8	G-3	*R6	C-2	*R32	B-4		
C16	E-1	D9	G-4	*R7	C-2	R33	B-2		
C17	G-1			*R8	D-2				
C18	G-2	IC1	F-2	*R9	C-2	*RV1	D-1		
C19	G-3	*IC2	G-3	R10	D-1				
*C20	H-1	IC3	B-3	*R11	D-1	*SW1	A-3		
C21	H-1			*R12	E-1				
C22	G-3	L1	E-3	R13	E-2	TP1	A-1		
C23	G-3	L2	E-4	*R14	E-1	TP2	A-1		
C24	G-1			*R15	F-2	TP3	H-1		
C25	H-2	Q1	D-2	*R16	F-1				
C26	D-3	*Q2	B-2	*R17	F-1			*; B SIDE	

NOTE
※1：基板の部品番号末尾が11の
C27、R32がともにマウント
トされる場合があります。こ
※1と組になっています。
When P/N suffix of PCB i
On some boards, no C27 a
C27 is mounted. (Refer t
board, too.)
※2：基板の部品番号末尾が12の
When P/N suffix of PCB i
※3：基板の部品番号末尾が11の
ません。
When P/N suffix of PCB i



SW1 OPERATION		
POSITION	SHUTTER SPEEÐ	FL MOÐE
0-7	OFF	INVALIÐ
8	1/60	VALIÐ
9	1/125	
A	1/250	
B	1/500	
C	1/1000	
Ð	1/2000	
E	1/4000	
F	1/10000	

PAL: OPEN IN XC-711
SHORT IN XC-711P

SW1 ÐEFUALT SETTING:
POSITION 0

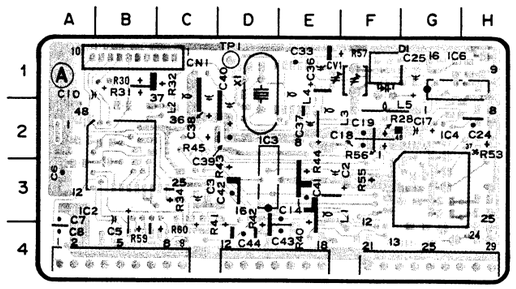
NOTE ※1：基板の部品番号末尾が11の場合
C27、R32がともにマウントされない場合とC27のみマウントされる場合があります。このときはPR-122基板の **NOTE** ※1と組になっています。
When P/N suffix of PCB is 11.
On some boards, no C27 and R32 are mounted, or only C27 is mounted. (Refer to **NOTE** ※1 of the PR-122 board, too.)

※2：基板の部品番号末尾が12の場合
When P/N suffix of PCB is 12.

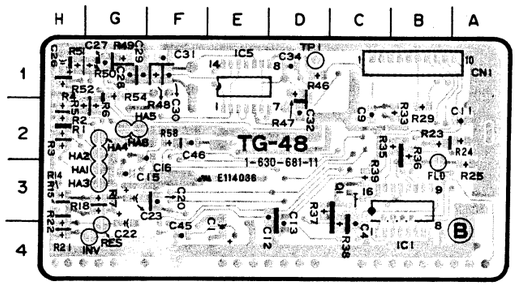
※3：基板の部品番号末尾が11の場合、CN1は5ピンまでしかありません。
When P/N suffix of PCB is 11, CN1 only has pin5.

DR-83
1-630-680-11, 12
XC-711 (UCJ)
XC-711P (EK)

TG-48 Board



TG-48 —A SIDE—
1-630-681-11
XC-711 (UCJ)
XC-711P (EK)

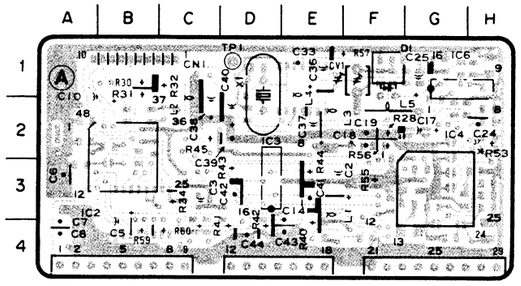


TG-48 —B SIDE—
1-630-681-11
XC-711 (UCJ)
XC-711P (EK)

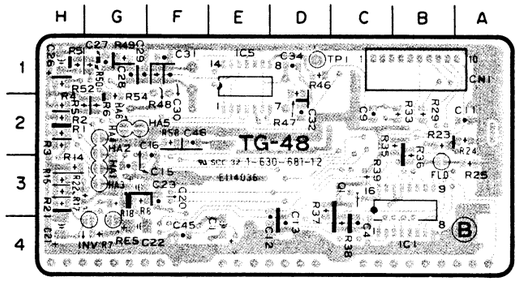
*C1	E-4	*C26	H-1	D1	F-1	*R15	H-3	R44	E-3	*FLD	B-3
C2	E-3	*C27	G-1			*R17	G-3	R45	C-2		
C3	C-3	*C28	G-1	*IC1	B-3	*R18	G-3	*R46	D-1	*HA1	G-3
*C4	C-4	*C29	G-1	IC2	B-3	*R21	H-4	*R47	D-1	*HA2	G-2
C5	B-3	*C30	F-1	IC3	D-2	*R22	H-4	*R48	F-1	*HA3	G-3
C6	A-3	*C31	F-1	IC4	G-2	*R23	B-2	*R49	G-1	*HA4	G-2
C7	A-3	*C32	D-2	*IC5	E-1	*R24	A-2	*R50	G-1	*HA5	G-2
C8	A-4	C33	E-1	IC6	G-1	*R25	A-3	*R51	H-1	*HA6	G-2
*C9	C-2	*C34	D-1			R28	F-2	*R52	H-1		
C10	A-1	C36	E-1	L1	E-3	*R29	B-2	R53	H-2	*INV	G-4
*C11	A-2	C37	E-2	L2	C-1	R30	B-1	*R54	G-1	*RES	G-4
*C12	D-3	C38	C-2	L3	E-2	R31	B-1	R55	F-3		
*C13	D-4	C39	D-2	L4	E-1	R32	C-1	R56	F-2		
C14	E-3	C40	D-2	L5	F-2	*R33	B-2	R57	F-1		
*C15	G-3	C41	E-3			R34	C-3	*R58	F-2		
*C16	F-3	C42	D-3	*Q1	C-3	*R35	B-2	R59	B-4		
C17	G-2	C43	E-4			*R36	B-2	R60	C-4		
C18	F-2	C44	D-4	*R1	H-2	*R37	D-3				
C19	F-2	*C45	F-4	*R2	H-2	*R38	C-4	TP1	D-1		
*C20	F-3	*C46	F-2	*R3	H-2	*R39	C-3				
*C22	G-4			*R4	H-2	R40	E-4	X1	D-1		
*C23	G-3	*CN1	C-1	*R5	H-2	R41	D-4				
C24	H-2			*R6	G-2	R42	D-4				
C25	G-1	CV1	F-1	*R14	H-3	R43	D-3				

*; B SIDE

XC-711 (UCJ)
XC-711P (EK)



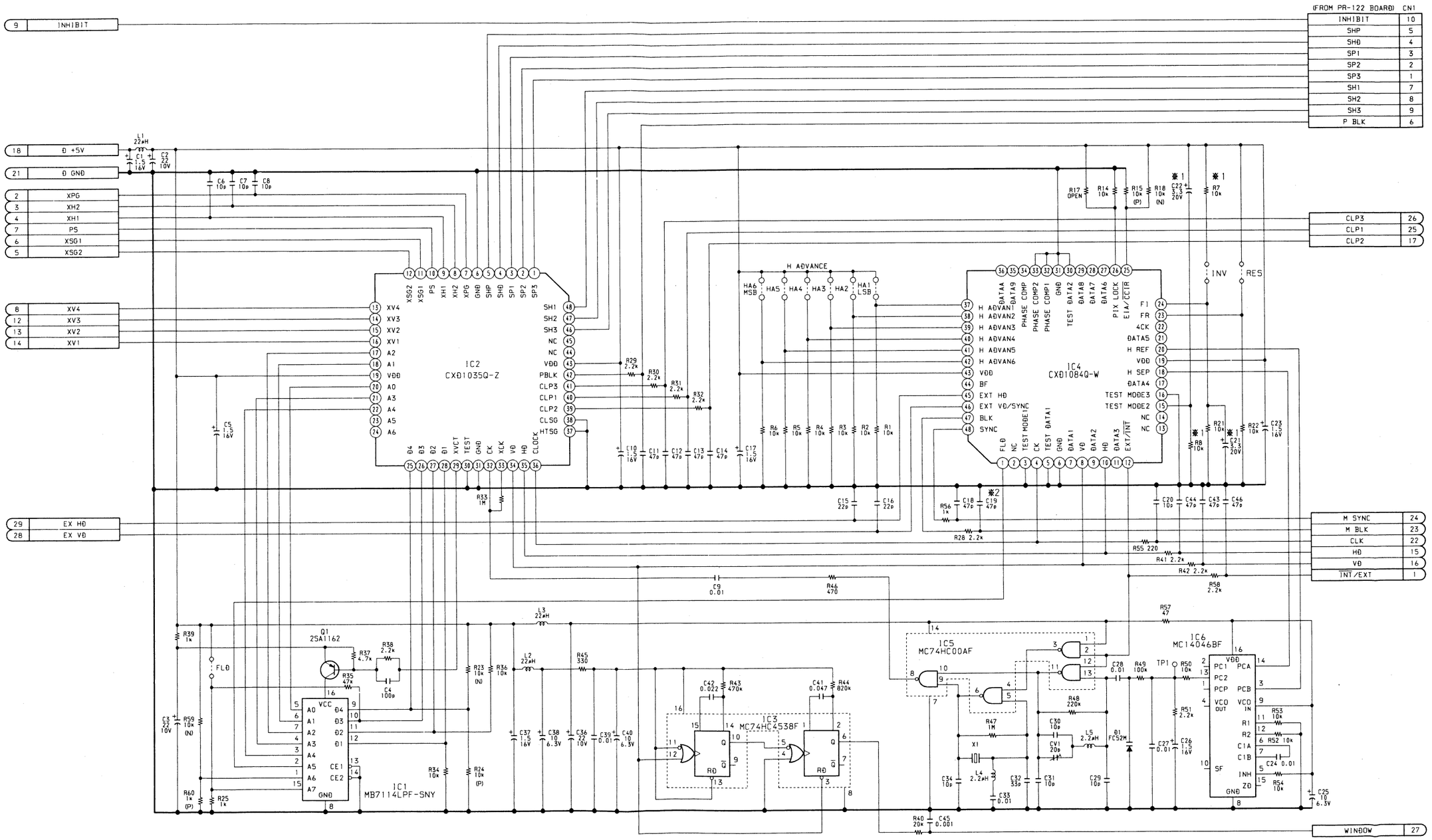
TG-48 —A SIDE—
1-630-681-12
XC-711 (UCJ)
XC-711P (EK)
XC-711RR (UCJ)



TG-48 —B SIDE—
1-630-681-12
XC-711 (UCJ)
XC-711P (EK)
XC-711RR (UCJ)

*C1	E-4	*C26	H-1	D1	F-1	*R14	H-3	R44	E-3	*FLD	B-3
C2	E-3	*C27	G-1			*R15	H-3	R45	C-2		
C3	C-3	*C28	G-1	*IC1	B-3	*R17	H-3	*R46	D-1	*HA1	G-3
*C4	C-4	*C29	G-1	IC2	B-3	*R18	G-3	*R47	D-1	*HA2	G-2
C5	B-3	*C30	F-1	IC3	D-2	*R21	H-4	*R48	F-1	*HA3	G-3
C6	A-3	*C31	F-1	IC4	G-2	*R22	H-3	*R49	G-1	*HA4	G-2
C7	A-3	*C32	D-2	*IC5	E-1	*R23	B-2	*R50	G-1	*HA5	G-2
C8	A-4	C33	E-1	IC6	G-1	*R24	A-2	*R51	H-1	*HA6	G-2
*C9	C-2	*C34	D-1			*R25	A-3	*R52	H-1		
C10	A-1	C36	E-1	L1	E-3	R28	F-2	R53	H-2	*INV	G-3
*C11	A-2	C37	E-2	L2	C-1	*R29	B-2	*R54	G-1	*RES	G-3
*C12	D-3	C38	C-2	L3	E-2	R30	B-1	R55	F-3		
*C13	D-4	C39	D-2	L4	E-1	R31	B-1	R56	F-2		
C14	E-3	C40	D-2	L5	F-2	R32	C-1	R57	F-1		
*C15	G-3	C41	E-3			*R33	B-2	*R58	F-2		
*C16	F-3	C42	D-3	*Q1	C-3	R34	C-3	R59	B-4		
C17	G-2	C43	E-4			*R35	B-2	R60	C-4		
C18	F-2	C44	D-4	*R1	H-2	*R36	B-2				
C19	F-2	*C45	F-4	*R2	H-2	*R37	D-3	TP1	D-1		
*C20	F-3	*C46	F-2	*R3	H-2	*R38	C-4				
*C21	H-4			*R4	H-2	*R39	C-3	X1	D-1		
*C22	G-4	*CN1	C-1	*R5	H-2	R40	E-4				
*C23	G-3			*R6	G-2	R41	D-4				
C24	H-2	CV1	F-1	*R7	G-4	R42	D-4				
C25	G-1			*R8	G-3	R43	D-3				

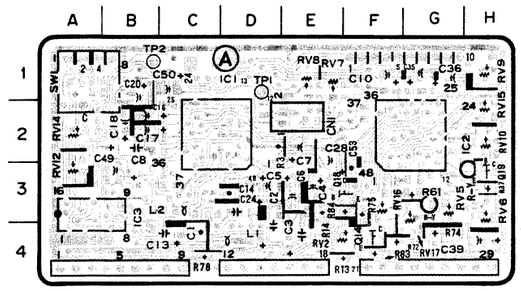
*; B SIDE



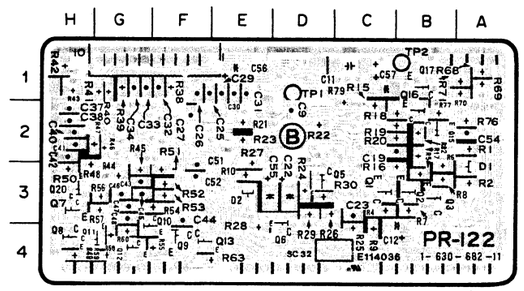
NOTE
※1：基板の部品番号末尾が11の場合に後付けした部品です。
These are tentative aftercare parts in P/N suffix-11 of PCB.
※2：C35(22pF)はC19(47pF)上にマウントされます。
C35(22pF) may be mounted on C19(47pF).

TG-48
1-630-681-11, 12
XC-711 (UCJ)
XC-711P (EK)

PR-122 Board



PR-122 —A SIDE—
1-630-682-11
XC-711 (UCJ)
XC-711P (EK)
XC-711RR (UCJ)

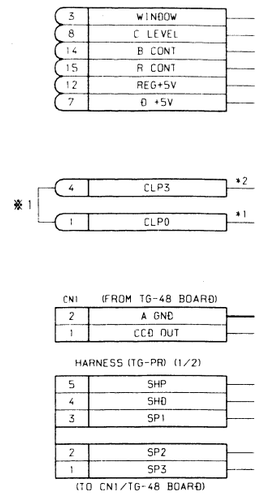


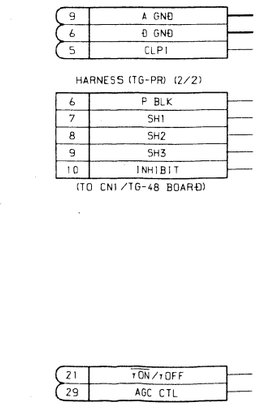
PR-122 —B SIDE—
1-630-682-11
XC-711 (UCJ)
XC-711P (EK)
XC-711RR (UCJ)

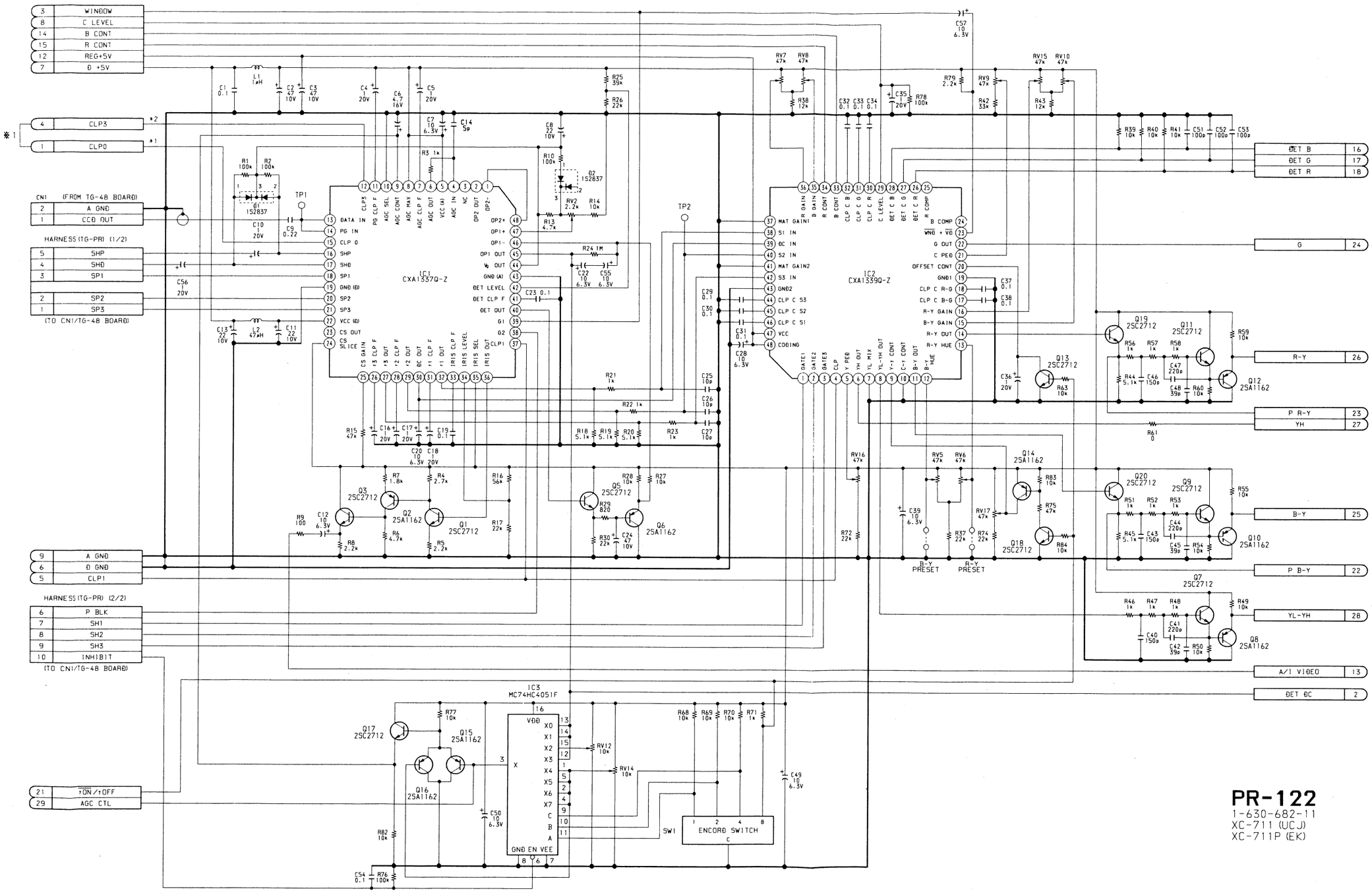
C1	C-4	*C29	E-1	*C55	D-3	*Q12	G-4	*R19	B-2	*R51	F-3	RV2	E-4
C2	D-4	*C30	E-1	*C56	E-1	*Q13	F-4	*R20	B-2	*R52	F-3	RV5	G-3
C3	E-4	*C31	E-1	*C57	C-1	Q14	F-4	*R21	E-2	*R53	F-3	RV6	H-3
C4	E-3	*C32	F-1			*Q15	B-2	*R22	D-2	*R54	F-3	RV7	E-1
C5	D-3	*C33	G-1	CN1	E-2	*Q16	B-2	*R23	E-2	*R55	F-4	RV8	E-1
C6	E-3	*C34	G-1			*Q17	B-1	*R24	D-3	*R56	G-3	RV9	H-1
C7	E-2	C35	G-1	*D1	A-3	Q18	E-3	*R25	C-4	*R57	G-3	RV10	H-2
C8	B-2	C36	G-1	*D2	E-3	Q19	H-3	*R26	D-3	*R58	G-4	RV12	A-3
*C9	D-2	*C37	H-2			*Q20	H-3	*R27	E-3	*R59	G-4	RV14	A-2
C10	F-1	*C38	H-2	IC1	D-2			*R28	E-4	*R60	G-4	RV15	H-2
*C11	C-1	C39	H-4	IC2	G-2	*R1	A-2	*R29	D-3	R61	G-3	RV16	F-3
*C12	B-4	*C40	H-2	IC3	B-3	*R2	A-3	*R30	D-3	*R63	E-4	RV17	G-4
C13	C-4	*C41	H-2			R3	D-2	R37	H-3	*R68	A-1		
C14	D-3	*C42	H-2	L1	D-4	*R4	C-3	*R38	F-1	*R69	A-1	SW1	A-1
C16	B-2	*C43	G-3	L2	C-3	*R5	B-3	*R39	G-1	*R70	A-1		
C17	B-2	*C44	F-3			*R6	B-3	*R40	G-1	*R71	A-1	TP1	D-1
C18	B-2	*C45	G-3	*Q1	C-3	*R7	B-3	*R41	G-1	R72	F-4	TP2	B-1
*C19	B-2	*C46	G-3	*Q2	B-3	*R8	B-3	*R42	H-1	R74	G-4		
C20	B-1	*C47	G-3	*Q3	B-3	*R9	C-4	*R43	H-1	R75	F-3	B-Y	G-3
*C22	D-3	*C48	G-3	*Q5	D-3	*R10	E-3	*R44	G-3	*R76	A-2	R-Y	H-3
*C23	C-3	C49	B-3	*Q6	D-4	R13	E-4	*R45	G-3	*R77	B-2		
C24	D-3	C50	C-1	*Q7	H-3	R14	E-3	*R46	G-2	R78	C-4		
*C25	F-1	*C51	F-3	*Q8	H-4	*R15	C-2	*R47	G-2	*R79	C-2		
*C26	F-1	*C52	F-3	*Q9	F-4	*R16	B-3	*R48	H-3	*R82	B-2		
*C27	F-2	C53	F-3	*Q10	F-4	*R17	B-2	*R49	H-4	R83	F-4		
C28	E-2	*C54	A-2	*Q11	G-4	*R18	B-2	*R50	H-3	R84	F-3		

*; B SIDE

NOTE ※1：基板の部品番号末尾が11の場合、＊1(CLP0)と＊2(CLP3)がジャンパー線で接続されたものがあります(MB-222基板側で接続されているときもあります)。 この場合、DR-83基板の※1のR32はマウントされていません。
When P/N suffix of PCB is 11, ＊1(CLP0) and ＊2(CLP3) may be connected by a jumper wire. (The MB-222 board may also be connected.) In this case, the ※1 R32 in the DR-83 board is not mounted.

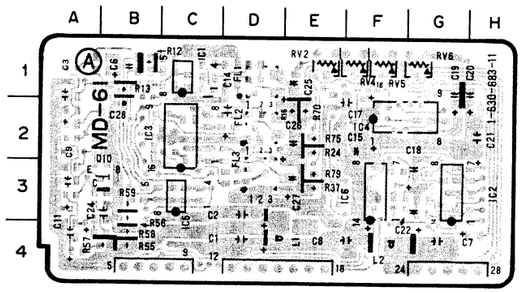




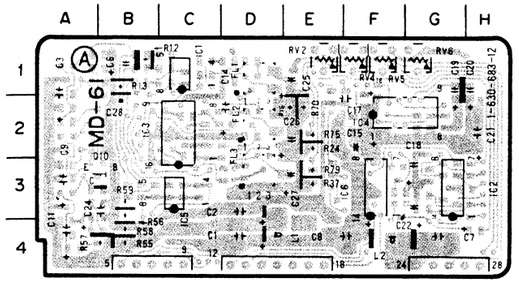


PR-122
1-630-682-11
XC-711 (UCJ)
XC-711P (EK)

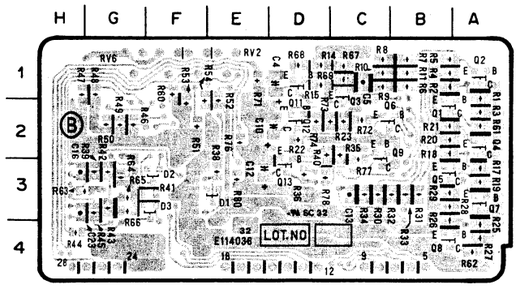
MD-61 Board



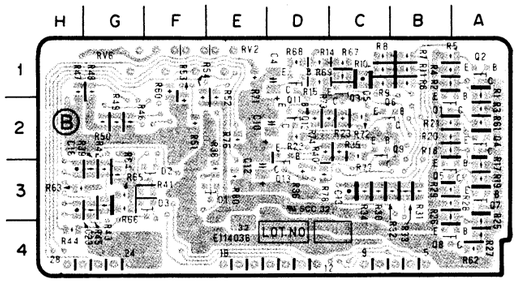
MD-61 —A SIDE—
1-630-683-11
XC-711 (UCJ)
XC-711P (EK)



MD-61 —A SIDE—
1-630-683-12
XC-711 (UCJ)
XC-711P (EK)
XC-711RR (UCJ)



MD-61 —B SIDE—
1-630-683-11
XC-711 (UCJ)
XC-711P (EK)



MD-61 —B SIDE—
1-630-683-12
XC-711 (UCJ)
XC-711P (EK)
XC-711RR (UCJ)

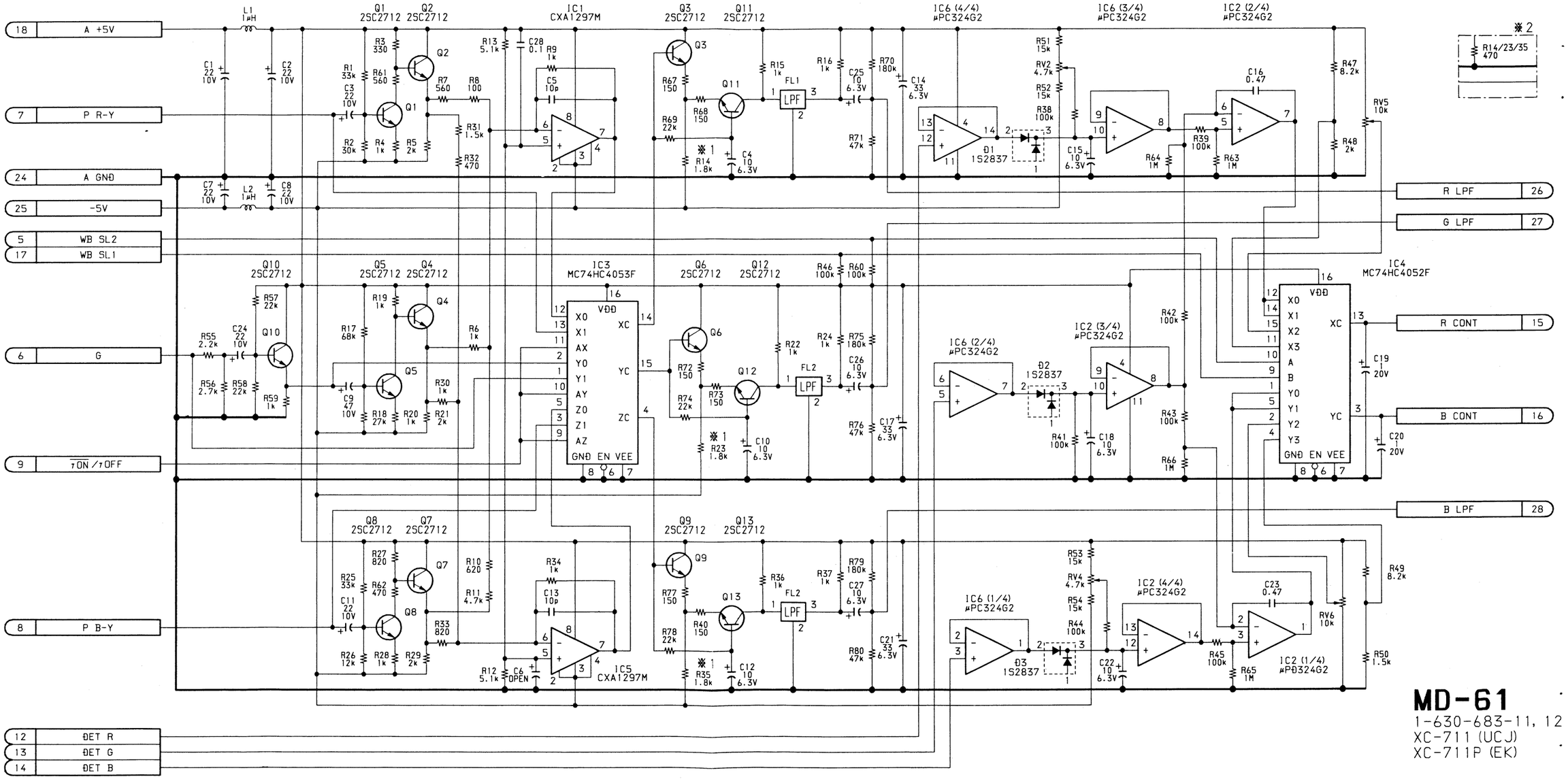
C1	D-4	C26	E-2	*Q4	A-2	*R15	D-1	*R40	D-2	*R65	G-3
C2	D-3	C27	E-3	*Q5	B-3	R16	E-2	*R41	F-3	*R66	G-3
C3	A-1	C28	B-2	*Q6	C-2	*R17	A-3	*R42	G-3	*R67	C-1
*C4	D-1			*Q7	A-3	*R18	B-2	*R43	G-3	*R68	D-1
*C5	C-1	*D1	E-3	*Q8	B-4	*R19	A-3	*R44	H-4	*R69	C-1
C6	B-1	*D2	F-3	*Q9	C-3	*R20	B-2	*R45	G-3	R70	E-2
C7	G-4	*D3	F-3	Q10	B-3	*R21	B-2	*R46	G-2	*R71	E-1
C8	F-4			*Q11	D-1	*R22	D-2	*R47	H-1	*R72	C-2
C9	A-3	FL1	D-1	*Q12	D-2	*R23	C-2	*R48	G-1	*R73	D-2
*C10	D-2	FL2	D-2	*Q13	D-3	R24	E-2	*R49	G-2	*R74	D-2
C11	A-4	FL3	D-3			*R25	A-4	*R50	G-2	R75	E-2
*C12	E-3			*R1	A-2	*R26	B-3	*R51	F-2	*R76	E-2
*C13	C-3	IC1	C-1	*R2	B-1	*R27	A-4	*R52	E-2	*R77	C-3
C14	D-2	IC2	G-3	*R3	A-2	*R28	B-3	*R53	F-2	*R78	D-3
C15	F-2	IC3	C-2	*R4	B-1	*R29	B-3	*R54	F-2	R79	E-3
*C16	H-3	IC4	F-2	*R5	B-1	*R30	C-3	R55	B-4	*R80	E-3
C17	F-2	IC5	C-3	*R6	B-1	*R31	B-3	R56	B-4		
C18	G-3	IC6	F-3	*R7	B-1	*R32	B-3	R57	B-4	RV2	E-1
C19	G-1			*R8	C-1	*R33	B-3	R58	B-4	RV4	F-1
C20	H-1	L1	D-4	*R9	C-1	*R34	C-3	R59	B-3	RV5	F-1
C21	H-2	L2	F-4	*R10	C-1	*R35	C-2	*R60	F-1	RV6	G-1
C22	G-3			*R11	B-1	*R36	D-3	*R61	A-2		
*C23	H-3	*Q1	B-2	R12	B-1	R37	E-3	*R62	A-4		
C24	B-3	*Q2	A-1	R13	B-1	*R38	E-3	*R63	H-3		
C25	E-1	*Q3	C-1	*R14	D-1	*R39	G-3	*R64	G-3		

*; B SIDE

C1	D-4	C26	E-2	*Q4	A-2	*R15	D-1	*R40	D-2	*R65	G-3
C2	D-3	C27	E-3	*Q5	B-3	R16	E-2	*R41	F-3	*R66	G-3
C3	A-1	C28	B-2	*Q6	C-2	*R17	A-3	*R42	G-3	*R67	C-1
*C4	D-1			*Q7	A-3	*R18	B-2	*R43	G-3	*R68	D-1
*C5	C-1	*D1	E-3	*Q8	B-4	*R19	A-3	*R44	H-4	*R69	C-1
C6	B-1	*D2	F-3	*Q9	C-3	*R20	B-2	*R45	G-3	R70	E-2
C7	G-4	*D3	F-3	Q10	B-3	*R21	B-2	*R46	G-2	*R71	E-1
C8	F-4			*Q11	D-1	*R22	D-2	*R47	H-1	*R72	C-2
C9	A-3	FL1	D-1	*Q12	D-2	*R23	C-2	*R48	G-1	*R73	D-2
*C10	D-2	FL2	D-2	*Q13	D-3	R24	E-2	*R49	G-2	*R74	D-2
C11	A-4	FL3	D-3			*R25	A-4	*R50	G-2	R75	E-2
*C12	E-3			*R1	A-2	*R26	B-3	*R51	F-2	*R76	E-2
*C13	C-3	IC1	C-1	*R2	B-1	*R27	A-4	*R52	E-2	*R77	C-3
C14	D-2	IC2	G-3	*R3	A-2	*R28	B-3	*R53	F-2	*R78	D-3
C15	F-2	IC3	C-2	*R4	B-1	*R29	B-3	*R54	F-2	R79	E-3
*C16	H-3	IC4	F-2	*R5	B-1	*R30	C-3	R55	B-4	*R80	E-3
C17	F-2	IC5	C-3	*R6	B-1	*R31	B-3	R56	B-4		
C18	G-3	IC6	F-3	*R7	B-1	*R32	B-3	R57	B-4	RV2	E-1
C19	G-1			*R8	C-1	*R33	B-3	R58	B-4	RV4	F-1
C20	H-1	L1	D-4	*R9	C-1	*R34	C-3	R59	B-3	RV5	F-1
C21	H-2	L2	F-4	*R10	C-1	*R35	C-2	*R60	F-1	RV6	G-1
C22	G-3			*R11	B-1	*R36	D-3	*R61	A-2		
*C23	H-3	*Q1	B-2	R12	B-1	R37	E-3	*R62	A-4		
C24	B-3	*Q2	A-1	R13	B-1	*R38	E-3	*R63	H-3		
C25	E-1	*Q3	C-1	*R14	D-1	*R39	G-3	*R64	G-3		

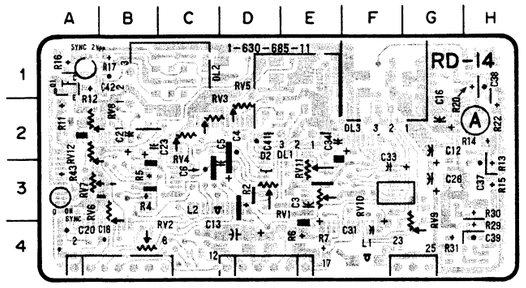
*; B SIDE

NOTE ※1のR14、R23、R35は基板の部品番号末尾が11の場合※2のようになっています。
R14, R23 and R35 described in ※1 are installed as described in ※2 in boards which have a P/N suffix of 11.

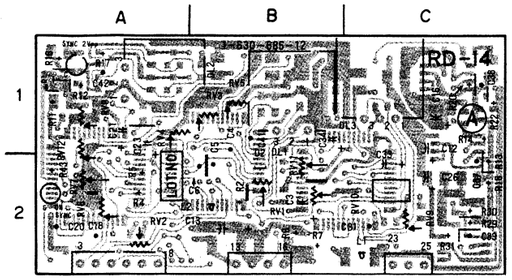


MD-61
1-630-683-11, 12
XC-711 (UCJ)
XC-711P (EK)

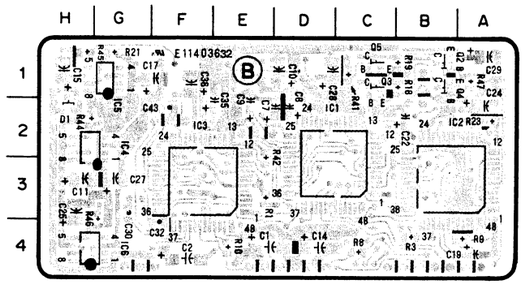
RD-14 Board



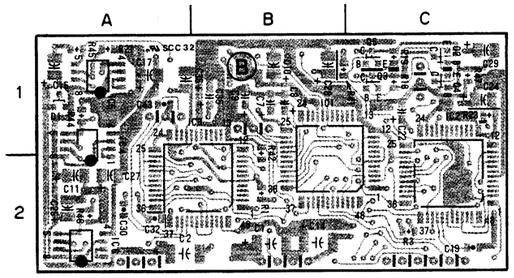
RD-14 –A SIDE–
1-630-685-11
XC-711 (UCJ)
XC-711P (EK)
XC-711RR (UCJ)



RD-14 –A SIDE–
1-630-685-12
XC-711 (UCJ)
XC-711P (EK)
XC-711RR (UCJ)



RD-14 –B SIDE–
1-630-685-11
XC-711 (UCJ)
XC-711P (EK)
XC-711RR (UCJ)

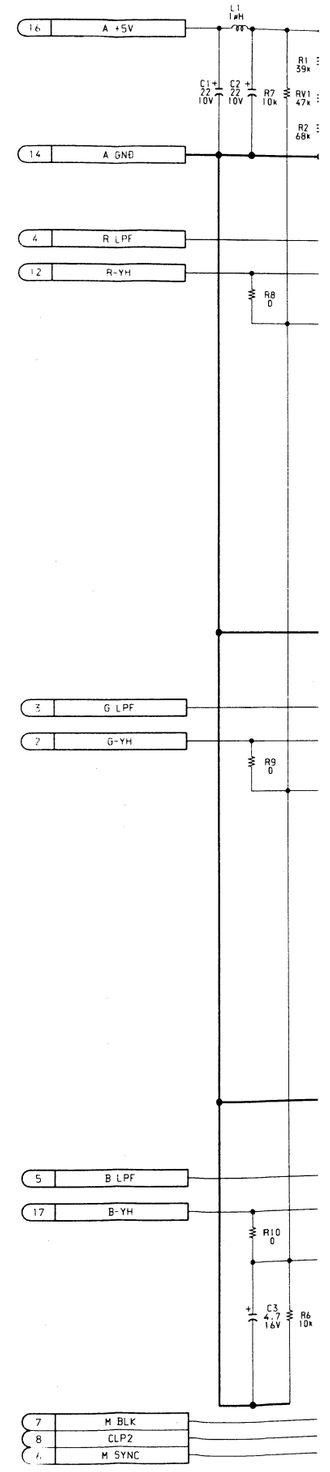


RD-14 –B SIDE–
1-630-685-12
XC-711 (UCJ)
XC-711P (EK)
XC-711RR (UCJ)

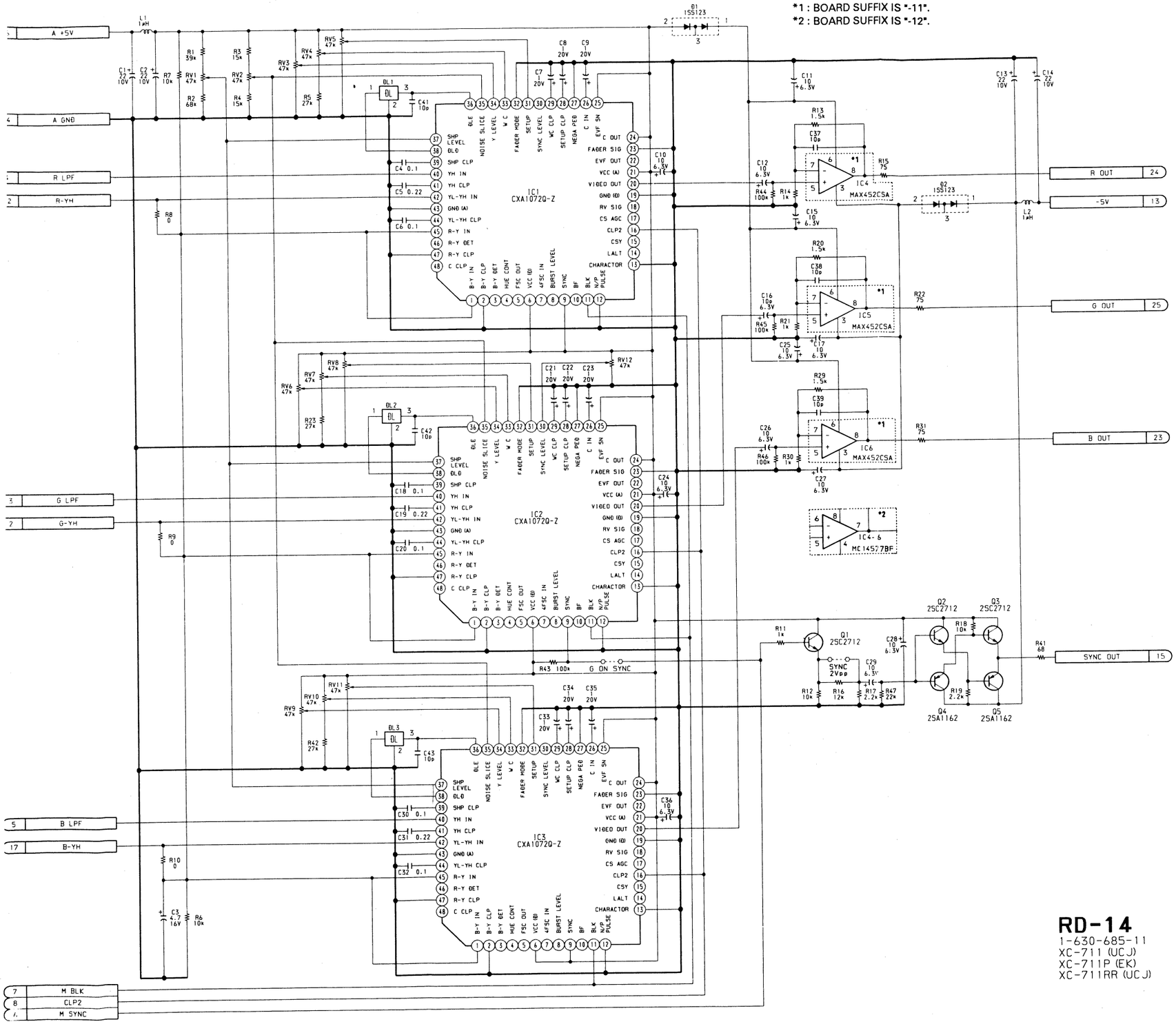
*C1	E-4	*C25	H-3	DL1	E-2	R5	B-3	R43	A-3
*C2	F-4	C26	G-3	DL2	C-1	R6	E-4	*R44	H-2
C3	E-3	*C27	G-3	DL3	F-2	R7	E-4	*R45	G-1
C4	D-2	*C28	D-1			*R8	C-4	*R46	G-3
C5	D-3	*C29	A-1	*IC1	D-2	*R9	A-4	*R47	A-1
C6	C-3	*C30	G-3	*IC2	B-2	R10	E-4		
*C7	D-2	C31	F-4	*IC3	F-2	R11	A-2	RV1	D-3
*C8	D-2	*C32	F-4	*IC4	G-2	R12	A-1	RV2	B-4
*C9	E-2	C33	F-3	*IC5	G-1	R13	H-3	RV3	C-2
*C10	D-1	C34	E-2	*IC6	G-4	R14	H-2	RV4	C-2
*C11	H-3	*C35	E-2			R15	H-3	RV5	D-2
C12	G-2	*C36	F-1	L1	F-4	R16	A-1	RV6	B-3
C13	D-4	C37	H-3	L2	C-3	R17	B-1	RV7	B-3
*C14	D-4	C38	H-1			*R18	B-1	RV8	A-2
*C15	H-1	C39	H-4	Q1	A-1	*R19	B-1	RV9	G-3
C16	G-2	C41	D-2	*Q2	B-1	R20	H-1	RV10	E-3
*C17	F-1	C42	A-1	*Q3	C-1	*R21	G-1	RV11	E-3
C18	B-4	*C43	F-2	*Q4	B-1	R22	H-2	RV12	A-2
*C19	A-4			*Q5	C-1	*R23	A-2		
C20	A-4	*D1	H-2			R29	H-4	G ON SYNC	A-3
C21	B-2	D2	D-3	*R1	E-3	R30	H-3		
*C22	B-2			R2	D-3	R31	G-4	SYNC 2Vpp	A-1
C23	B-2			*R3	B-4	*R41	C-1		
*C24	A-2			R4	B-3	*R42	E-2		

*; B SIDE

*C1	B-2	*C25	C-2	DL3	C-1	R7	B-2	*R45	C-1
*C2	C-2	C26	C-2			*R8	A-2	*R46	C-2
C3	B-2	*C27	C-2	*IC1	B-1	*R9	B-2	*R47	A-1
C4	B-1	*C28	B-1	*IC2	A-1	*R10	B-2		
C5	B-1	*C29	A-1	*IC3	B-1	R11	A-1	RV1	B-2
C6	A-2	*C30	C-2	*IC4	C-1	R12	A-1	RV2	A-2
*C7	B-1	C31	C-2	*IC5	C-1	R13	C-2	RV3	B-1
*C8	B-1	*C32	C-2	*IC6	C-2	R14	C-1	RV4	A-1
*C9	B-1	C33	C-2			R15	C-2	RV5	B-1
*C10	B-1	C34	B-1	L1	C-2	R16	A-1	RV6	A-2
*C11	C-2	*C35	B-1	L2	B-2	R17	A-1	RV7	A-2
C12	C-1	*C36	C-1			*R18	A-1	RV8	A-1
C13	B-2	C37	C-2	Q1	A-1	*R19	A-1	RV9	C-2
*C14	B-2	C38	C-1	*Q2	A-1	*R20	A-1	RV10	C-2
*C15	C-1	C39	C-2	*Q3	A-1	*R21	C-1	RV11	B-2
C16	C-1	C41	B-1	*Q4	A-1	R22	C-1	RV12	A-1
*C17	C-1	C42	A-1	*Q5	A-1	R23	A-1		
C18	A-2	*C43	C-1			R29	C-2	G ON SYNC	A-2
*C19	A-2			*R1	B-2	R30	C-2		
C20	A-2	D1	A-1	R2	B-2	R31	C-2	SYNC 2Vpp	A-1
C21	A-1	D2	B-2	*R3	A-2	*R41	B-1		
*C22	A-1			R4	A-2	*R42	B-2		
C23	A-1	DL1	B-1	R5	A-2	R43	A-2		
*C24	A-1	DL2	B-1	R6	B-2	*R44	C-1	*; B SIDE	

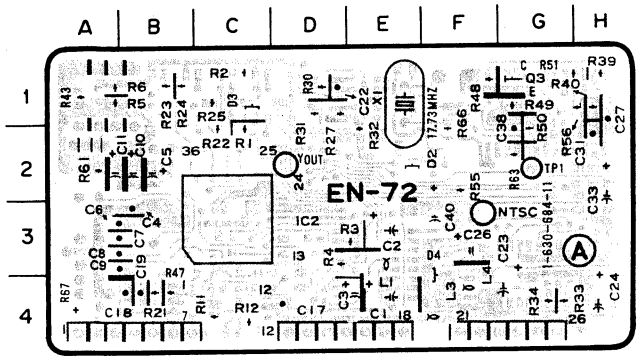


*1 : BOARD SUFFIX IS "-11".
*2 : BOARD SUFFIX IS "-12".

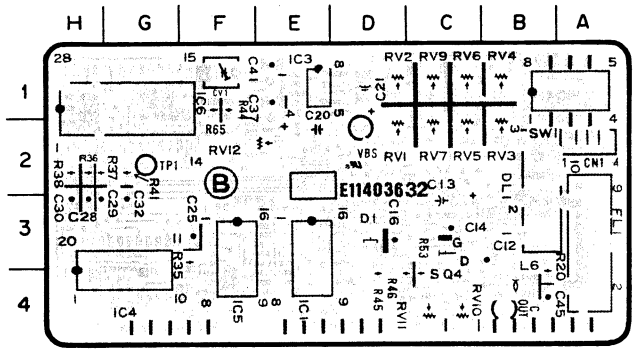


RD-14
1-630-685-11
XC-711 (UCJ)
XC-711P (EK)
XC-711RR (UCJ)

EN-72 Board



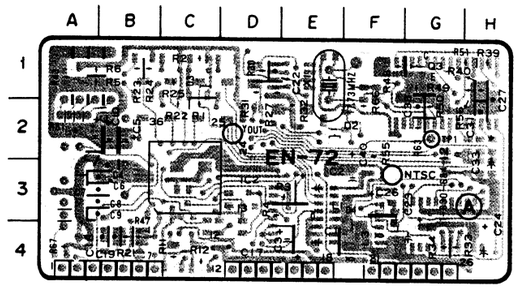
EN-72 —A SIDE—
1-630-684-11
XC-711 (UCJ)
XC-711P (EK)



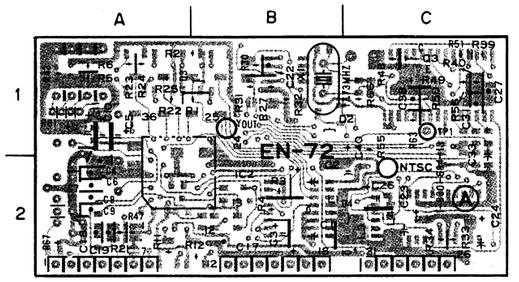
EN-72 —B SIDE—
1-630-684-11
XC-711 (UCJ)
XC-711P (EK)

C1	E-4	*C25	F-3	*DL1	B-2	R5	A-1	R43	A-1	*RV6	C-1
C2	E-3	C26	F-3			R6	A-1	*R44	F-1	*RV7	C-2
C3	E-4	C27	H-1	*FL1	A-3	R11	C-4	*R45	D-4	*RV9	C-1
C4	B-3	*C28	H-3			R12	C-4	*R46	D-4	*RV10	C-4
C5	B-2	*C29	H-3	*IC1	E-4	*R20	B-4	R47	B-4	*RV11	C-4
C6	A-3	*C30	H-3	IC2	C-3	R21	B-4	R48	F-1	*RV12	E-2
C7	A-3	C31	H-2	*IC3	E-1	R22	C-2	R49	G-1		
C8	A-3	*C32	G-3	*IC4	G-4	R23	B-1	R50	G-2	*SW1	A-1
C9	A-3	C33	H-3	*IC5	F-4	R24	B-1	R51	G-1		
C10	B-2	*C37	E-1	*IC6	G-1	R25	C-1	*R53	C-4	TP1	G-1
C11	A-2	C38	G-2			R27	D-1	R55	F-2		
*C12	B-3	C40	F-3	L1	E-3	R30	D-1	R56	H-1	X1	E-1
*C13	C-3	*C41	E-1	L3	F-4	R31	D-1	R61	A-2		
*C14	C-3	*C45	B-4	L4	F-4	R32	E-2	R63	G-2	*C OUT	B-4
*C16	D-3			*L6	B-4	R33	G-4	*R65	F-1	NTSC	F-3
C17	D-4	*CN1	A-2			R34	G-4	R66	F-2	Y OUT	D-2
C18	B-4			Q3	G-2	*R35	F-3	R67	A-4	*VBS	D-2
C19	B-4	*CV1	F-1	*Q4	C-3	*R36	H-2				
*C20	E-2					*R37	H-2	*RV1	D-2		
*C21	D-1	*D1	D-3	R1	C-2	*R38	H-2	*RV2	D-1		
C22	D-1	D2	E-2	R2	C-1	R39	H-1	*RV3	B-2		
C23	G-3	D3	C-1	R3	E-3	R40	H-1	*RV4	B-1		
C24	H-4	D4	F-3	R4	D-3	*R41	G-2	*RV5	C-2	*; B SIDE	

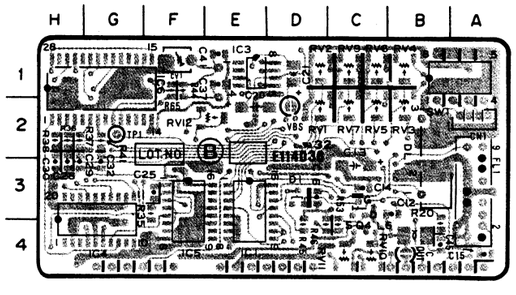
EN-72 Board



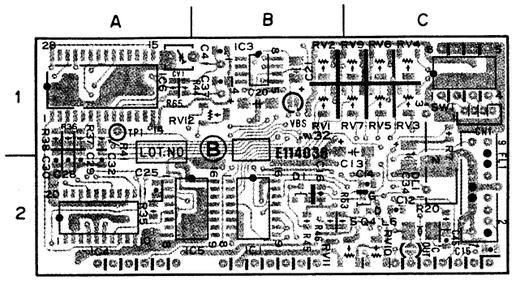
EN-72 —A SIDE—
1-630-684-12
XC-711 (UCJ)
XC-711P (EK)
XC-711RR (UCJ)



EN-72 —A SIDE—
1-630-684-13
XC-711 (UCJ)
XC-711P (EK)
XC-711RR (UCJ)



EN-72 —B SIDE—
1-630-684-12
XC-711 (UCJ)
XC-711P (EK)
XC-711RR (UCJ)

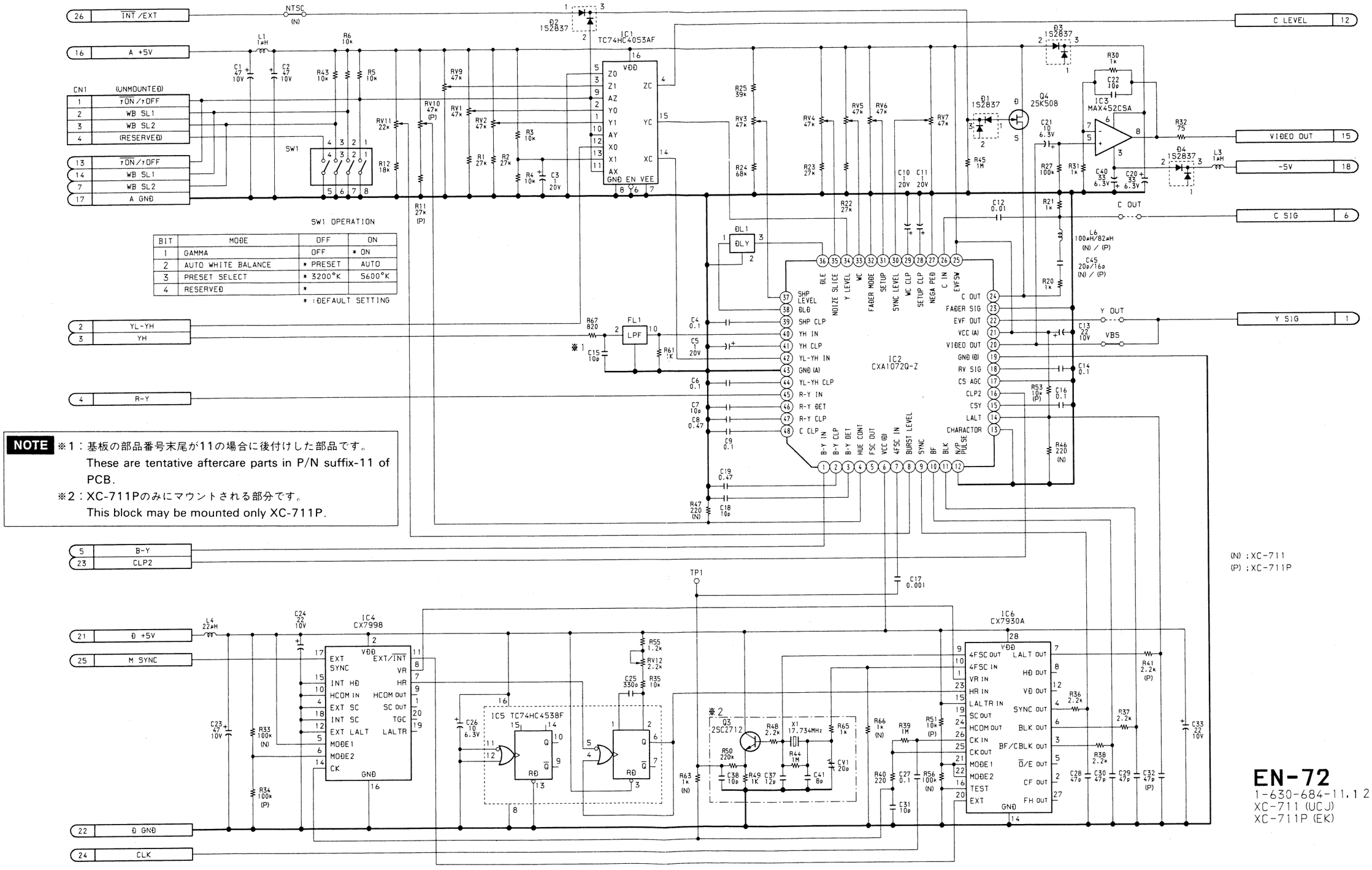


EN-72 —B SIDE—
1-630-684-13
XC-711 (UCJ)
XC-711P (EK)
XC-711RR (UCJ)

C1	E-4	*C25	F-3	*DL1	B-2	R6	A-1	*R45	D-4	*RV10	C-4				
C2	E-3	C26	F-3			R11	C-4	*R46	D-4	*RV11	C-4				
C3	E-4	C27	H-1	*FL1	A-3	R12	C-4	R47	B-4	*RV12	E-2				
C4	B-3	*C28	H-3			*R20	B-4	R48	F-1						
C5	B-2	*C29	H-3	*IC1	E-4	R21	B-4	R49	G-1	*SW1	A-1				
C6	A-3	*C30	H-3	IC2	C-3	R22	C-2	R50	G-2						
C7	A-3	C31	H-2	*IC3	E-1	R23	B-1	R51	G-1	TP1	G-1				
C8	A-3	*C32	G-3	*IC4	G-4	R24	B-1	*R53	C-4						
C9	A-3	C33	H-3	*IC5	F-4	R25	C-1	R55	F-2	X1	E-1				
C10	B-2	*C37	E-1	*IC6	G-1	R27	D-1	R56	H-1						
C11	A-2	C38	G-2			R30	D-1	R61	A-2	*C OUT	B-4				
*C12	B-3	C40	F-3	L1	E-3	R31	D-1	R63	G-2	NTSC	F-3				
*C13	C-3	*C41	E-1	L3	F-4	R32	E-2	*R65	F-1	Y OUT	D-2				
*C14	C-3	*C45	B-4	L4	F-4	R33	G-4	R66	F-2	*VBS	D-2				
*C15	A-4			*L6	B-4	R34	G-4	R67	A-4						
*C16	D-3	*CN1	A-2			*R35	F-3								
C17	D-4			Q3	G-2	*R36	H-2	*RV1	D-2						
C18	B-4	*CV1	F-1	*Q4	C-3	*R37	H-2	*RV2	D-1						
C19	B-4					*R38	H-2	*RV3	B-2						
*C20	E-2	*D1	D-3	R1	C-2	R39	H-1	*RV4	B-1						
*C21	D-1	D2	E-2	R2	C-1	R40	H-1	*RV5	C-2						
C22	D-1	D3	C-1	R3	E-3	*R41	G-2	*RV6	C-1						
C23	G-3	*D4	F-3	R4	D-3	R43	A-1	*RV7	C-2						
*C24	H-4			R5	A-1	*R44	F-1	*RV9	C-1	*; B SIDE					

C1	B-2	C22	B-1	*FL1	A-2	R6	A-1	*R46	B-2	*TP1	C-1				
C2	B-2	C23	C-2			R12	A-2	R47	A-2						
C3	B-2	C24	C-2	*IC1	B-2	*R20	A-2	R55	C-2	X1	B-1				
C4	A-2	*C25	C-2	IC2	B-2	R21	A-2	R56	C-1						
C5	A-1	C26	C-2	*IC3	B-1	R22	A-1	R61	A-1	*C OUT	C-2				
C6	A-2	C27	C-1	*IC4	C-2	R23	A-1	R63	C-1	NTSC	C-2				
C7	A-2	*C28	C-2	*IC5	C-2	R24	A-1	R66	C-1	Y OUT	B-1				
C8	A-2	*C29	C-2	*IC6	C-1	R25	A-1	R67	A-2	*VBS	B-1				
C9	A-2	*C30	C-2			R27	B-1								
C10	A-1	C31	C-1	L1	B-2	R30	B-1	*RV1	B-1						
C11	A-1	C33	C-2	L3	C-2	R31	B-1	*RV2	B-2						
*C12	A-2	C40	C-2	L4	C-2	R32	B-1	*RV3	A-1						
*C13	A-1	*C45	A-2	*L6	A-2	R33	C-2	*RV4	A-1						
*C14	A-2					*R35	C-2	*RV5	A-1						
*C15	A-2	*D1	B-2	*Q4	A-2	*R36	C-1	*RV6	A-1						
*C16	B-2	D2	B-2			*R37	C-1	*RV7	A-1						
C17	B-2	D3	A-1	R1	A-1	*R38	C-1	*RV9	A-1						
C18	A-2	D4	B-2	R2	A-1	R39	C-1	*RV11	B-2						
C19	A-2			R3	B-2	R40	C-1	*RV12	C-1						
*C20	B-1	*DL1	A-2	R4	B-2	R43	A-1								
*C21	B-1			R5	A-1	*R45	B-2	*SW1	A-1	*; B SIDE					

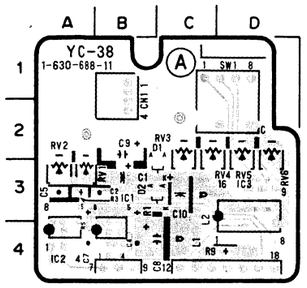
NOTE



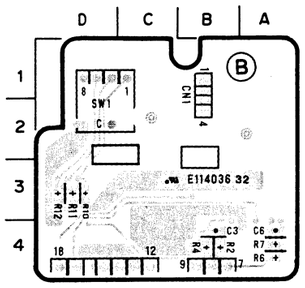
NOTE
※1：基板の部品番号末尾が11の場合に後付けした部品です。
These are tentative aftercare parts in P/N suffix-11 of PCB.
※2：XC-711Pのみにマウントされる部分です。
This block may be mounted only XC-711P.

EN-72
1-630-684-11,12
XC-711 (UCJ)
XC-711P (EK)

YC-38 Board



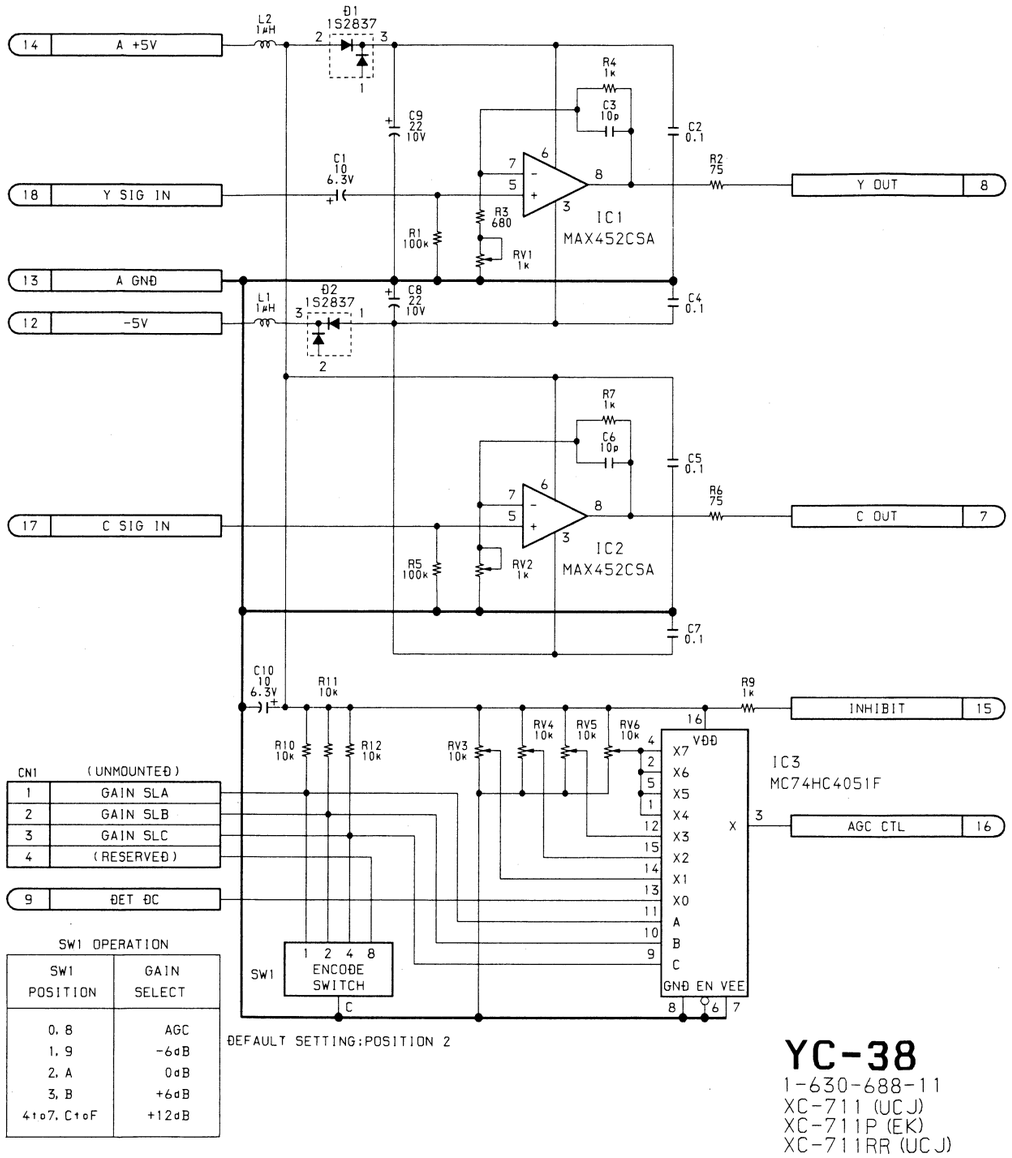
YC-38 —A SIDE—
1-630-688-11
XC-711 (UCJ)
XC-711P (EK)
XC-711RR (UCJ)



YC-38 —B SIDE—
1-630-688-11
XC-711 (UCJ)
XC-711P (EK)
XC-711RR (UCJ)

C1	B-3	R1	B-3
C2	B-3	*R2	B-4
*C3	B-4	R3	A-3
C4	B-4	*R4	B-4
C5	A-3	R5	A-3
*C6	A-4	*R6	A-4
C7	A-4	*R7	A-4
C8	C-4	R9	D-4
C9	B-2	*R10	D-3
C10	C-3	*R11	D-3
		*R12	D-3
CN1	B-2		
		RV1	A-3
D1	C-3	RV2	A-3
D2	C-3	RV3	C-2
		RV4	D-3
IC1	B-4	RV5	D-3
IC2	A-4	RV6	D-3
IC3	D-3		
		SW1	D-1
L1	C-4		
L2	C-3		

*; B SIDE

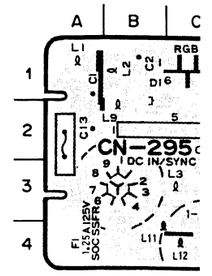


SW1 OPERATION

SW1 POSITION	GAIN SELECT
0, 8	AGC
1, 9	-6dB
2, A	0dB
3, B	+6dB
4 to 7, C to F	+12dB

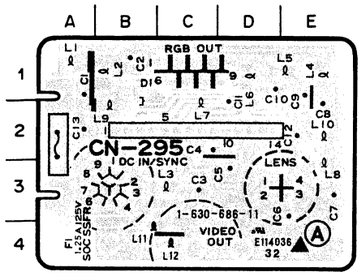
YC-38
1-630-688-11
XC-711 (UCJ)
XC-711P (EK)
XC-711RR (UCJ)

CN-295 Boar



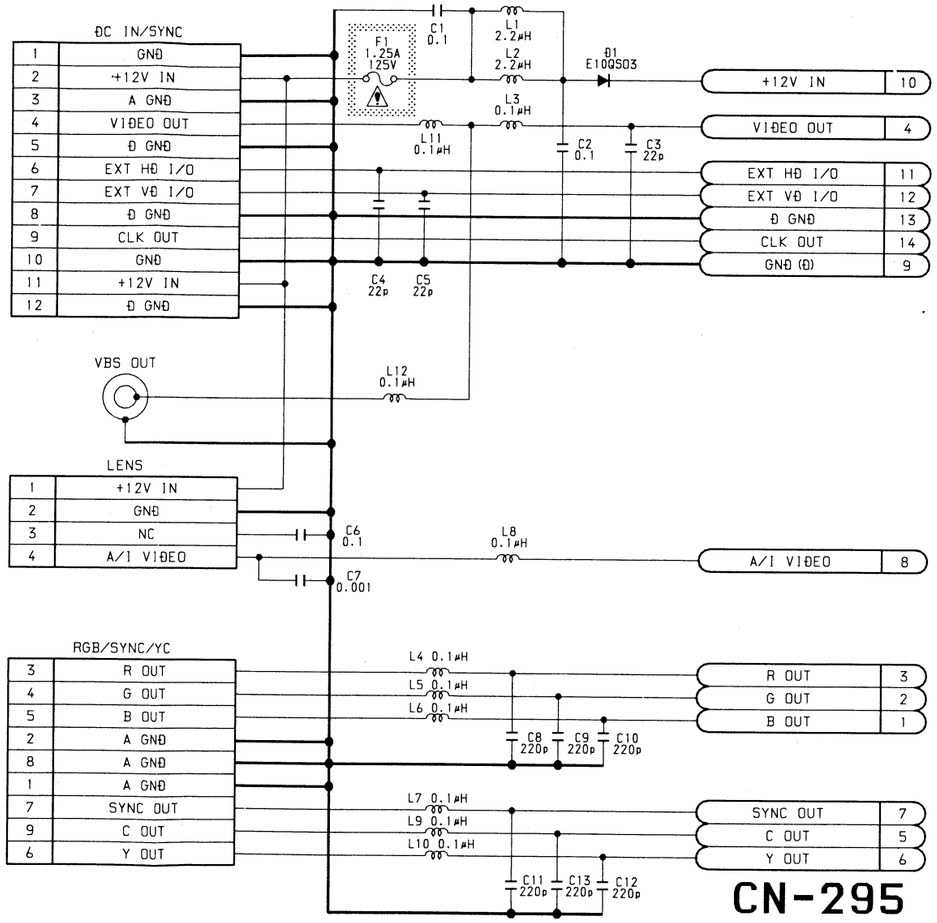
C1	A-1
C2	B-1
C3	C-3
C4	C-2
C5	D-3
C6	E-3
C7	E-3
C8	E-2
C9	E-1
C10	D-1
C11	D-2
C12	E-2
C13	A-2
D1	B-1

CN-295 Board



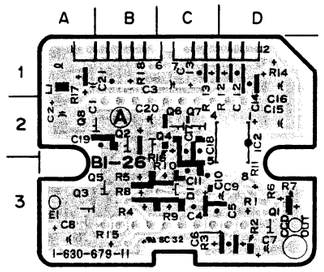
CN-295 —A SIDE—
1-630-686-11
XC-711 (UCJ)
XC-711P (EK)
XC-711RR (UCJ)

C1	A-1	F1	A-2
C2	B-1		
C3	C-3	L1	A-1
C4	C-2	L2	B-1
C5	D-3	L3	C-3
C6	E-3	L4	E-1
C7	E-3	L5	E-1
C8	E-2	L6	D-1
C9	E-1	L7	C-2
C10	D-1	L8	E-3
C11	D-2	L9	B-2
C12	E-2	L10	E-2
C13	A-2	L11	B-4
		L12	C-4
D1	B-1		



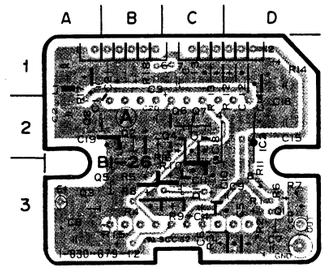
CN-295
1-630-686-11
XC-711 (UCJ)
XC-711P (EK)
XC-711RR (UCJ)

BI-26 Board



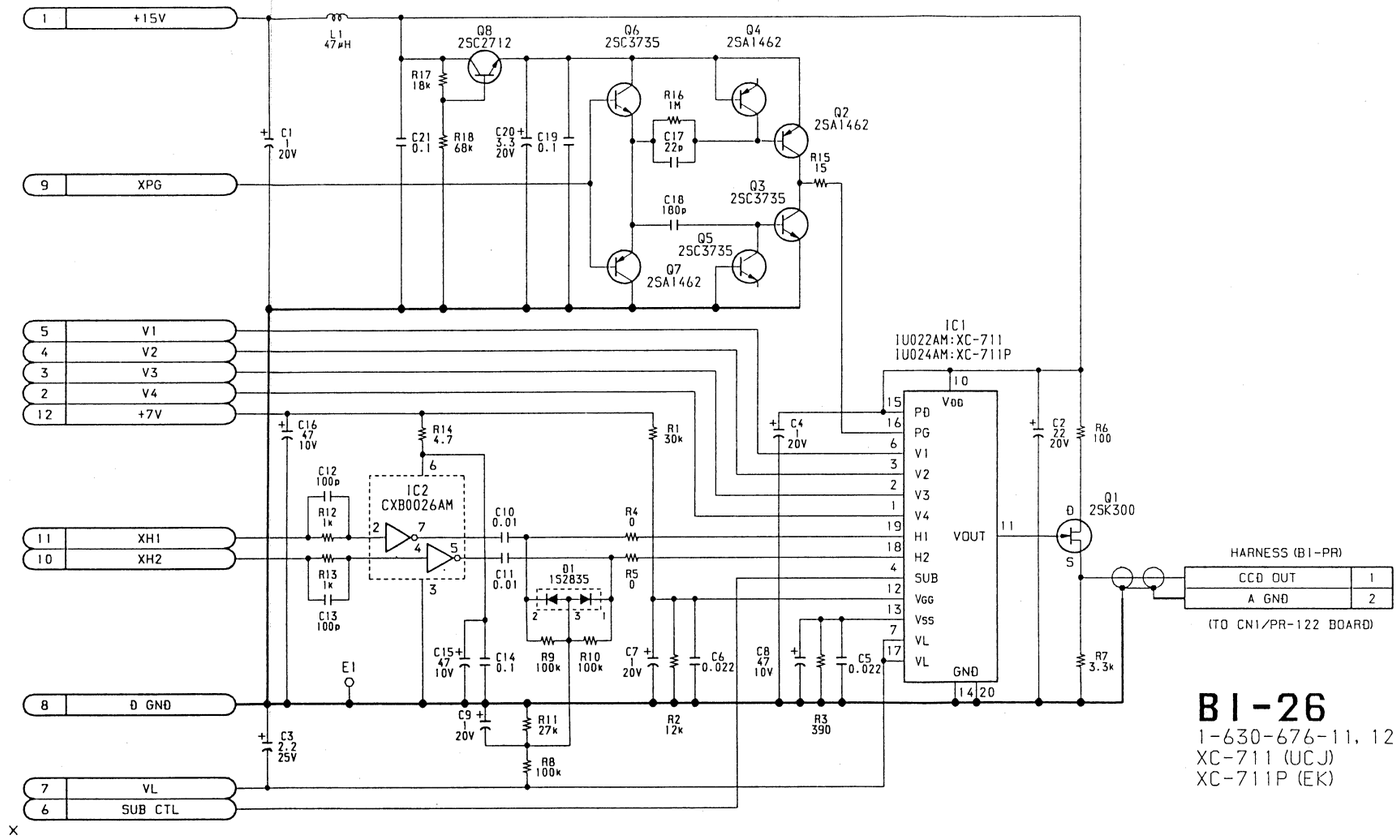
BI-26 —A SIDE—
1-630-679-11
XC-711 (UCJ)
XC-711P (EK)

C1	A-1	C14	D-1	IC2	D-2	R1	D-3	R14	D-1
C2	A-2	C15	D-2			R2	D-4	R15	B-4
C3	C-1	C16	D-1	L1	A-1	R3	C-4	R16	C-2
C4	C-3	C17	C-2			R4	B-3	R17	A-1
C5	D-4	C18	C-2	Q1	D-4	R5	B-3	R18	B-1
C6	D-4	C19	B-2	Q2	B-2	R6	D-3		
C7	D-4	C20	B-2	Q3	A-3	R7	D-3		
C8	A-3	C21	B-1	Q4	B-2	R8	B-3		
C9	D-3			Q5	B-3	R9	C-3		
C10	C-3	D1	C-3	Q6	C-2	R10	C-3		
C11	C-3			Q7	C-2	R11	D-3		
C12	D-1	E1	A-3	Q8	B-2	R12	D-1		
C13	C-1					R13	C-1		



BI-26 —A SIDE—
1-630-679-12
XC-711 (UCJ)
XC-711P (EK)
XC-711RR (UCJ)

C1	A-1	C14	D-1	IC2	D-2	R1	D-3	R14	D-1
C2	A-2	C15	D-2			R2	D-4	R15	B-4
C3	C-1	C16	D-1	L1	A-1	R3	C-4	R16	C-2
C4	C-3	C17	C-2			R4	B-3	R17	A-1
C5	D-4	C18	C-2	Q1	D-4	R5	B-3	R18	B-1
C6	D-4	C19	B-2	Q2	B-2	R6	D-3		
C7	D-4	C20	B-2	Q3	A-3	R7	D-3		
C8	A-3	C21	B-1	Q4	B-2	R8	B-3		
C9	D-3			Q5	B-3	R9	C-3		
C10	C-3	D1	C-3	Q6	C-2	R10	C-3		
C11	C-3			Q7	C-2	R11	D-3		
C12	D-1	E1	A-3	Q8	B-2	R12	D-1		
C13	C-1					R13	C-1		



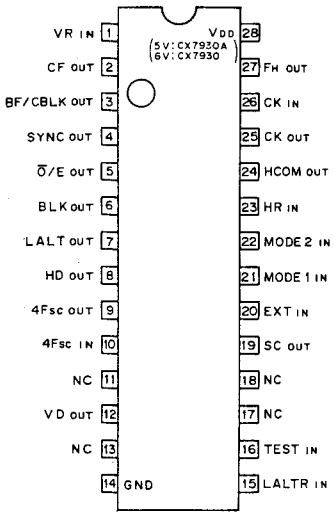
SECTION B
SEMICONDUCTOR

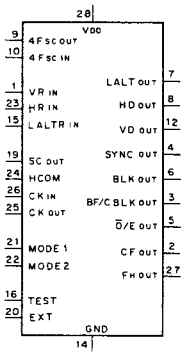
TYPE	PAGE
1S1555	B-16
1S2835	B-16
1S2837	B-16
1SS119	B-16
1SS123	B-16
2SA1162	B-16
2SA1462	B-16
2SB804	B-16
2SC2712	B-16
2SC3735	B-16
2SD1005	B-16
2SK300	B-16
2SK508	B-16
CX7930A	B-2
CX7998	B-4
CXA1065M	B-4
CXA1072Q-Z	B-5
CXA1121Q-Z	B-6
CXA1297M	B-5
CXA1337Q-Z	B-5
CXB0026AM	B-5
CXD1035BQ-Z	B-8
CXD1084Q-W	B-14
CXD1141M	B-7
E10QS03	B-16
E10QS04	B-16
FC52M	B-16
IU022AM	B-5
IU024AM	B-5
MAX452CSA	B-7
MB7114LPF	B-7
MC146046BF	B-13
RD5.1EL2	B-16
TC74HC00AF	B-13
TC74HC4051AF	B-13
TC74HC4052AF	B-13
TC74HC4053AF	B-13
TC74HC4538F	B-15
uPC324G2	B-7

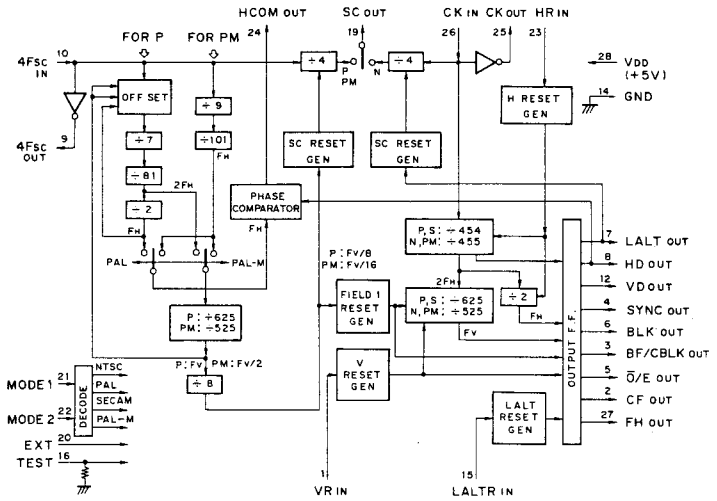
CX7930A (SONY) FLAT PACKAGE

C-MOS SYNC GENERATOR (NTSC, PAL-M, PAL, SECAM)

— TOP VIEW —







O/E : ODD/EVEN FIELD
CF : COLOR FRAME PULSE
HCOM : H COMPARATOR

SYSTEM	4Fsc	CLOCK
NTSC	910 FH	910FH
PAL	1135FH+2Fv	908FH
PALM	909FH	910FH
SECAM	———	908FH

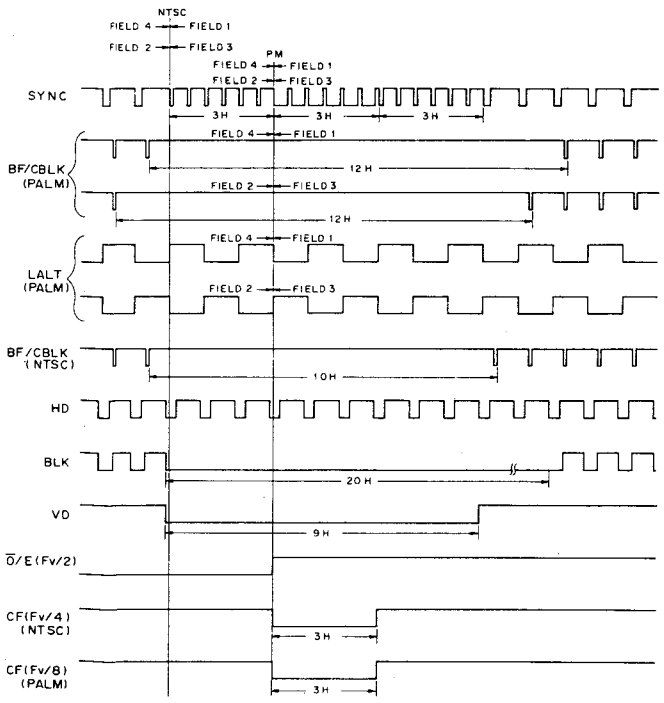
INPUTS		SYSTEM
MODE 1	MODE 2	
0	0	NTSC
0	1	SECAM
1	0	PALM
1	1	PAL

0 ; LOW LEVEL (GND)
1 ; HIGH LEVEL (VDD)

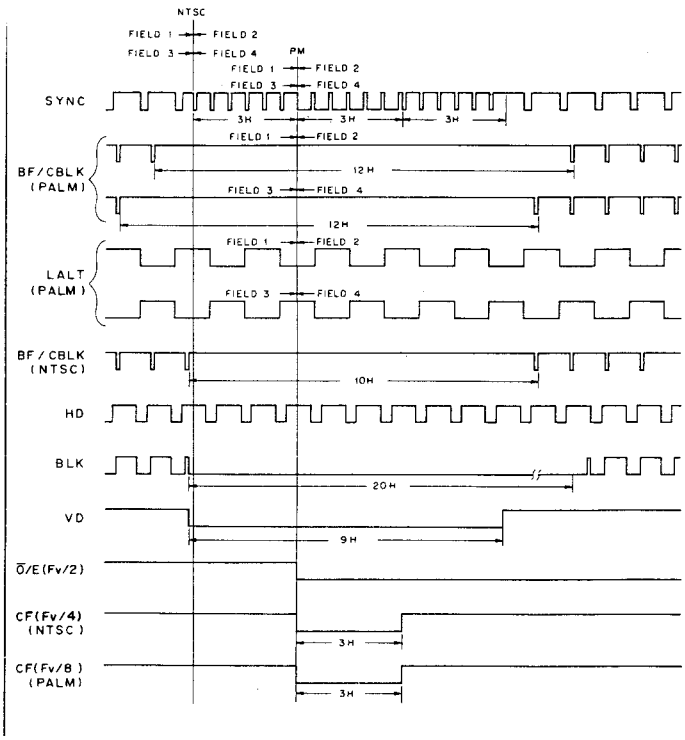
INPUTS		FUNCTION
EXT	TEST	
0	0	INTERNAL
0	1	INVALID
1	0	EXT
1	1	TEST

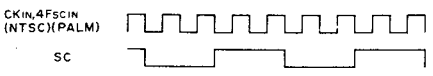
TEST "0": OPEN (INTERNALLY PULLED DOWN)

NTSC, PAL-M (FIELD 1,3)

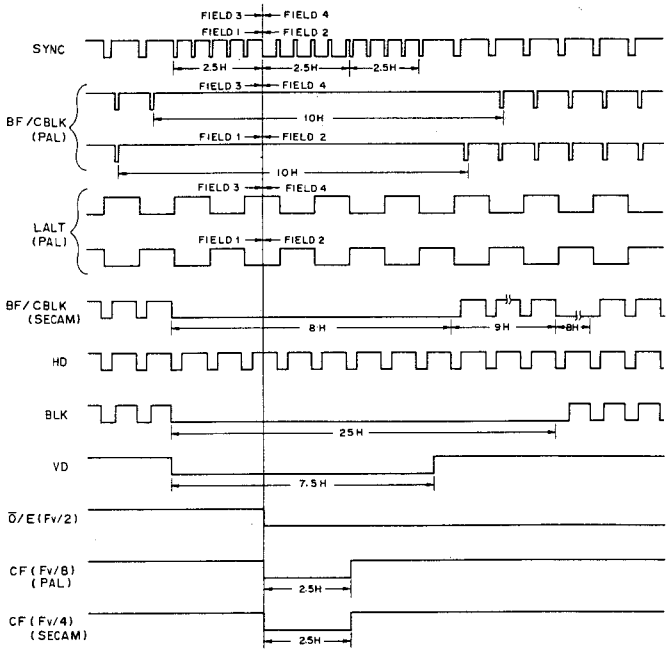


NTSC, PAL-M (FIELD 2,4)

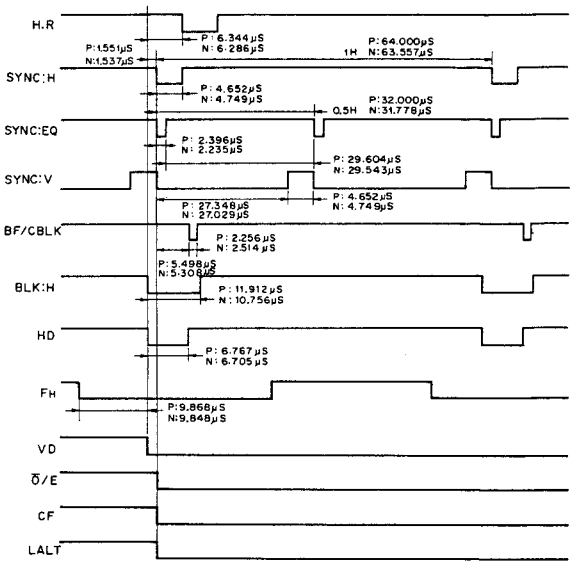




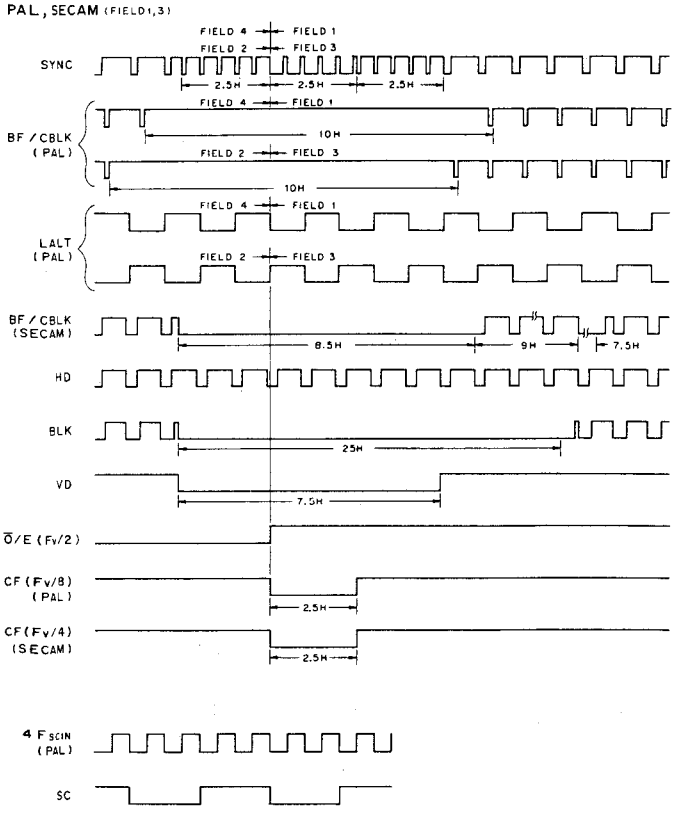
PAL, SECAM (FIELD 4, 2)



P: PAL, SECAM
N: NTSC, PALM



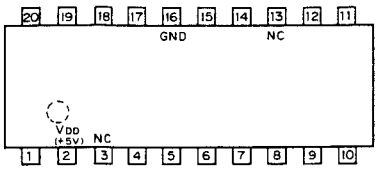
PAL, SECAM (FIELD 1, 3)



CX7998 (SONY) FLAT PACKAGE

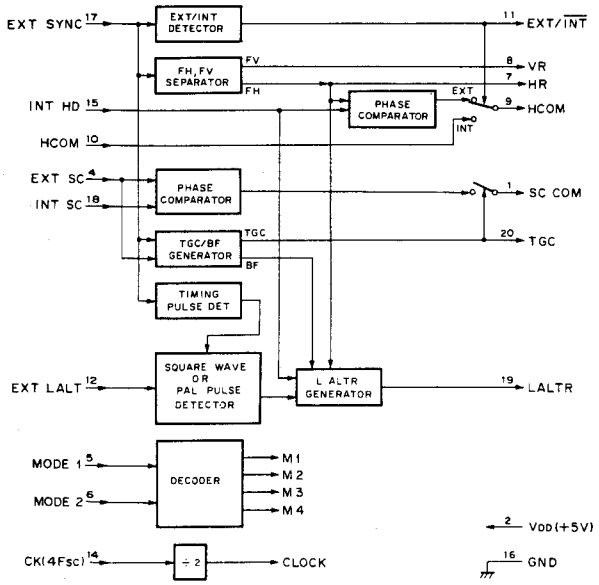
C-MOS GENLOCK DRIVER

— TOP VIEW —



INPUTS		EXT LOCK MODE	
MODE 1	MODE 2		
0	0	M1	PAL:VBS
1	0	M2	PAL-M:VBS
0	1	M3	PAL:VS/SC/LALT
			SECAM:VS/SC/LALT
1	1	M4	NTSC:VBS
			NTSC:VS/SC
			PAL-M:VS/SC/LALT

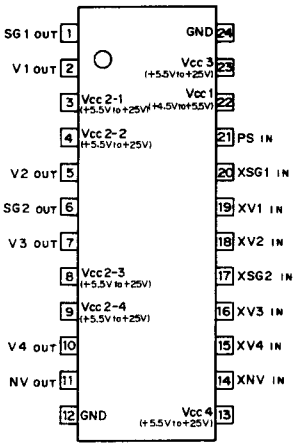
0 ; LOW LEVEL
1 ; HIGH LEVEL



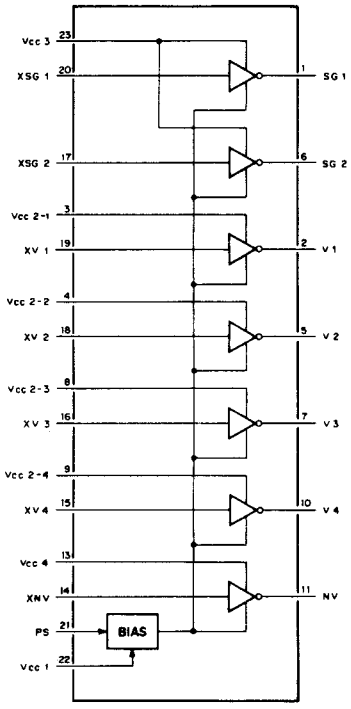
CXA1065M (SONY) FLAT PACKAGE

INVERTING DRIVER FOR CCD CLOCK WITH POWER SAVE

— TOP VIEW —



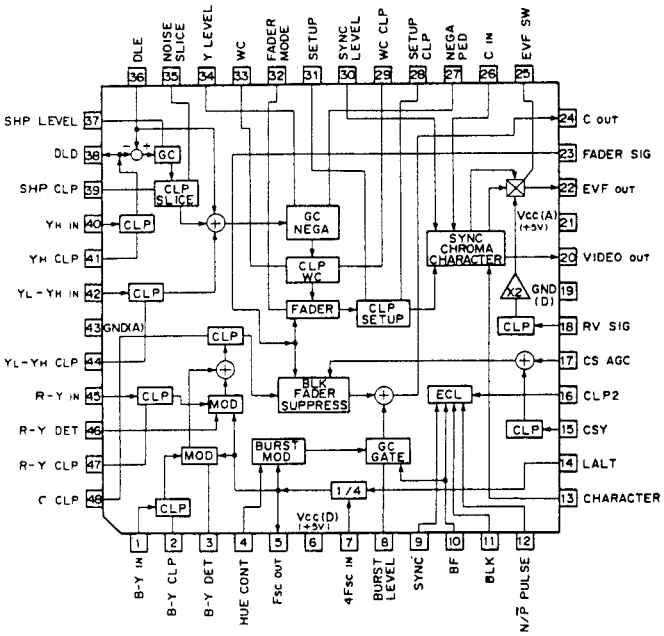
XV1-XV4 ; VERTICAL REGISTER TRANSMISSION CLOCK INPUT
V1 - V4 ; VERTICAL REGISTER TRANSMISSION CLOCK OUTPUT
XSG1, XSG2 ; SENSOR GATE PULSE INPUT
SG1, SG2 ; SENSOR GATE PULSE OUTPUT
XNV ; DRIVER INPUT
NV ; DRIVER OUTPUT
PS ; POWER SAVE INPUT
Vcc 1 ; BIAS VOLTAGE
Vcc 2-1 ; V1 OUTPUT PULSE VOLTAGE
Vcc 2-2 ; V2 OUTPUT PULSE VOLTAGE
Vcc 2-3 ; V3 OUTPUT PULSE VOLTAGE
Vcc 2-4 ; V4 OUTPUT PULSE VOLTAGE
Vcc 3 ; SG1, SG2 OUTPUT PULSE VOLTAGE
Vcc 4 ; NV OUTPUT PULSE VOLTAGE



CXA1072Q-Z (SONY) FLAT PACKAGE

CCD CAMERA SIGNAL PROCESSOR

– TOP VIEW –

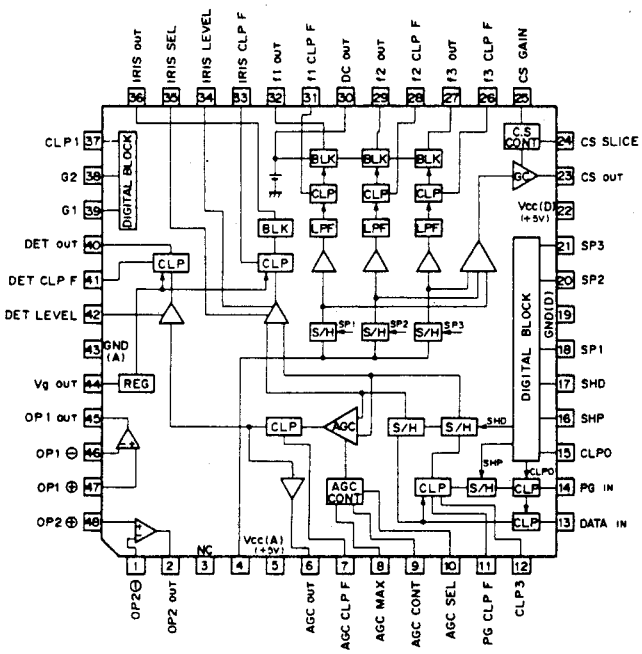


AGC	: AUTOMATIC GAIN CONTROL	DLE	: DELAY LINE END
BF	: BURST FLAG	EVF	: ELECTRIC VIEW FINDER
BLK	: BLANKING	GC	: GAIN CONTROL
C IN	: CHROMA INPUT	N/$\overline{P}$	: NEGA/$\overline{POSI}$
CLP	: CLAMP	LALT	: LINE ALTERNATE
CONT	: CONTROL	PED	: PEDESTAL
CS	: CHROMA SUPPRESS	RV	: RETURN VIDEO
DET	: DETECTOR	SHP	: SHARPNESS
DLD	: DELAY LINE DRIVE	WC	: WHITE CLIP

CXA1337Q-Z (SONY) FLAT PACKAGE

CCD CAMERA SIGNAL PROCESSOR

– TOP VIEW –

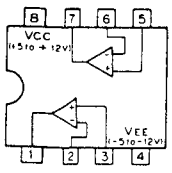


AGC	: AUTOMATIC GAIN CONTROL	G1	: BLK PULSE INPUT
BLK	: BLANKING	G2	: WINDOW PULSE INPUT
C IN	: CHROMA INPUT	GC	: GAIN CONTROL
CLP	: CLAMP	OP	: OPERATIONAL AMP.
CONT	: CONTROL	S/H	: SAMPLE HOLD
CS	: CHROMA SUPPRESS	SEL	: SELECT
DET	: DETECTOR	Vg	: REGULATOR OUTPUT

CXA1297M (SONY) FLAT PACKAGE

OPERATIONAL AMPLIFIER

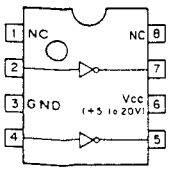
– TOP VIEW –



CXB0026AM (SONY) FLAT PACKAGE

DUAL INVERTING CLOCK DRIVER

– TOP VIEW –

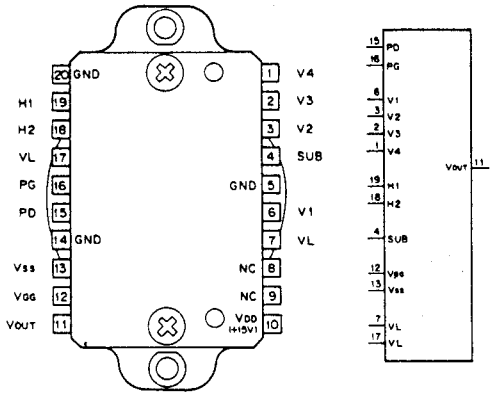


IU022AM (SONY) (NTSC)

IU024AM (SONY) (PAL)

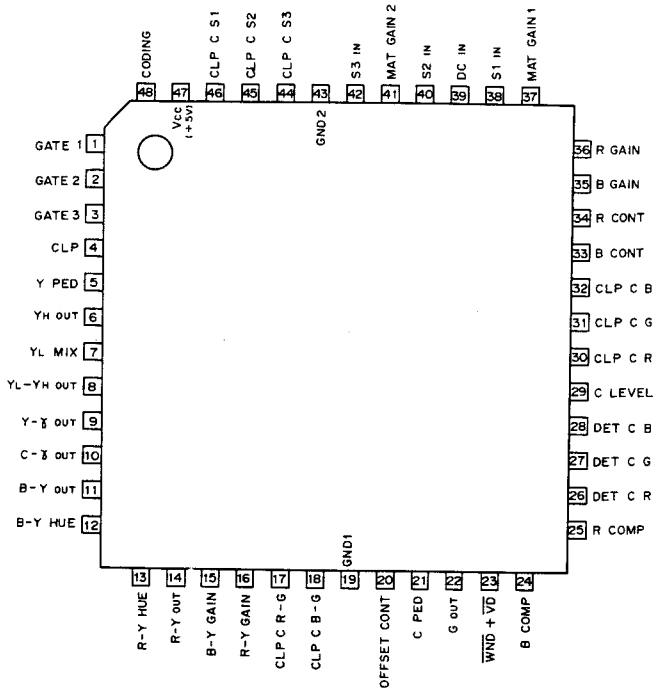
CCD IMAGE BLOCK FOR COLOR CAMERA

– BOTTOM VIEW –

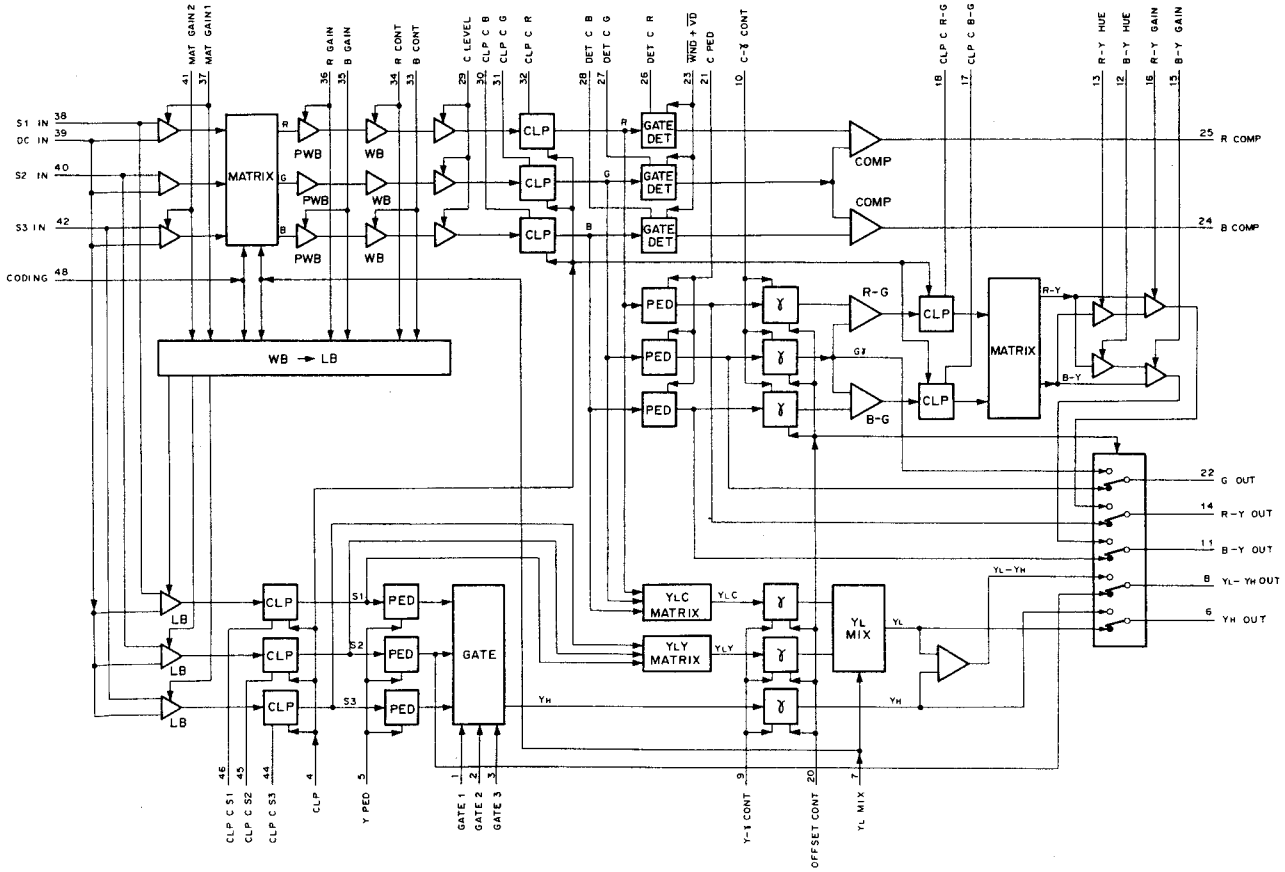


H1, H2	: TRANSFER CLOCK INPUTS OF HORIZONTAL SHIFT REGISTER
PG	: PRECHARGE DRAIN BIAS INPUT
PD	: OUTPUT RESET CLOCK INPUT
SUB	: SUBSTRATUM
V1 – V4	: TRANSFER CLOCK INPUTS OF VERTICAL SHIFT REGISTER
V_{OG}	: GATE BIAS INPUT FOR OUTPUT AMP.
VL	: BIAS INPUT FOR LOOKOUT TRANSISTOR
V_{OUT}	: SIGNAL OUTPUT
V_{SS}	: SOURCE BIAS INPUT FOR OUTPUT AMP.

CXA1121Q-Z (SONY) FLAT PACKAGE
SIGNAL PROCESSOR FOR CCD COLOR CAMERA
– TOP VIEW –



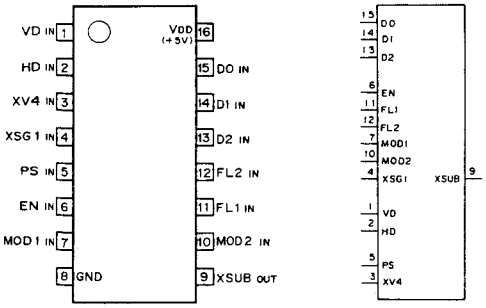
C LEVEL ; CHROMA LEVEL
CLP ; CLAMP PULSE
CLP C ; CLAMP CAPACITOR
CODING ; COLOR CODING
CONT ; CONTROL
DET ; DETECTOR
MAT ; MATRIX
PED ; PEDESTAL
WND ; WINDOW
γ ; GAMMA



CXD1141M (SONY)

C-MOS ELECTRIC SHUTTER TIMING PULSE GENERATOR

— TOP VIEW —

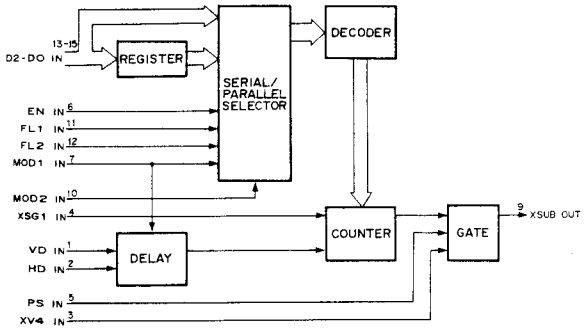


MODE SELECTION

EN	MOD1	MOD2	FL1	FL2	D2	D1	D0	SHUTTER SPEED
1	1	1	1		0	0	0	1/60
1	1	1	1		0	0	1	1/125
1	1	1	1		0	1	0	1/250
1	1	1	1		0	1	1	1/500
1	1	1	1		1	0	0	1/1000
1	1	1	1		1	0	1	1/2000
1	1	1	1		1	1	0	1/4000
1	1	1	1		1	1	1	1/10000
1	0	1	1		0	0	0	1/60
1	0	1	1		0	0	1	1/125
1	0	1	1		0	1	0	1/250
1	0	1	1		0	1	1	1/500
1	0	1	1		1	0	0	1/1000
1	0	1	1		1	0	1	1/2000
1	0	1	1		1	1	0	1/4000
1	0	1	1		1	1	1	1/10000
1	1		0	1				1/100
1	1		0	0				1/120
1	0		0	1				1/100
1	0		0	0				1/120
0								NORMAL

0: LOW LEVEL
1: HIGH LEVEL

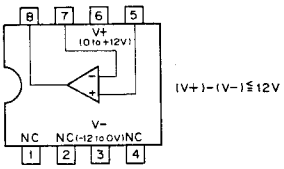
```
D0-D3 ; ESTABLISH INPUTS OF SHUTTER SPEED
EN    ; ENABLE INPUT LOW: NORMAL MODE, HIGH: ELECTRONIC SHUTTER MODE
FL1   ; MODE SELECT INPUT. LOW: FLICKERLESS, HIGH: NORMAL
FL2   ; MODE SELECT INPUT. LOW: 60HZ, HIGH: 50HZ
HD    ; HORIZONTAL DRIVE PULSE INPUT
MOD1  ; MODE SELECT INPUT. LOW: PAL, HIGH: NTSC
MOD2  ; MODE SELECT INPUT. LOW: SERIAL INPUT, HIGH: PARALLEL INPUT
PS    ; POWER SAVE PULSE INPUT
VD    ; VERTICAL DRIVE PULSE INPUT
XSG1  ; READ OUT PULSE INPUT OF SENSOR ELECTRON
XSUB  ; ELECTRON SWEEP OUT PULSE INPUT
XV4   ; VERTICAL SCAN CLOCK INPUT
```



MAX452CSA (MAXIM) FLAT PACKAGE

C-MOS 50 MHz VIDEO AMPLIFIER

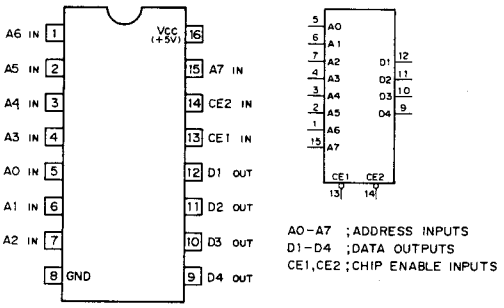
– TOP VIEW –



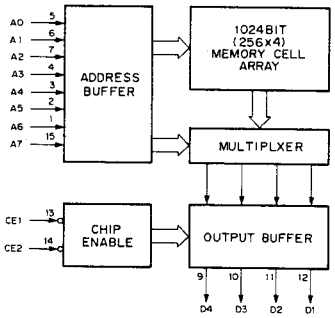
MB7114LPF (FUJITSU) (ACCESS TIME = 50 nS) FLAT PACKAGE

1024-BIT (256 x 4) PROM

— TOP VIEW —



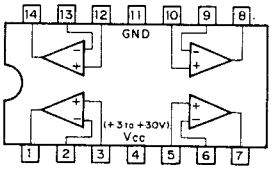
A0–A7 ; ADDRESS INPUTS
D1–D4 ; DATA OUTPUTS
CE1,CE2 ; CHIP ENABLE INPUTS



uPC324G2 (NEC) FLAT PACKAGE

QUAD OP AMPLIFIER

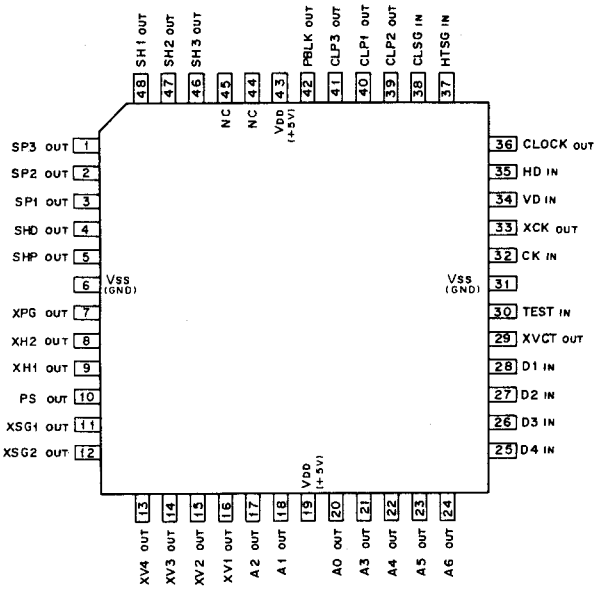
— TOP VIEW —



CXD1035BQ-Z (SONY) FLAT PACKAGE

C-MOS TIMING PULSE GENERATOR FOR CCD CAMERA

— TOP VIEW —



MODE SELECTION WITHOUT ROM

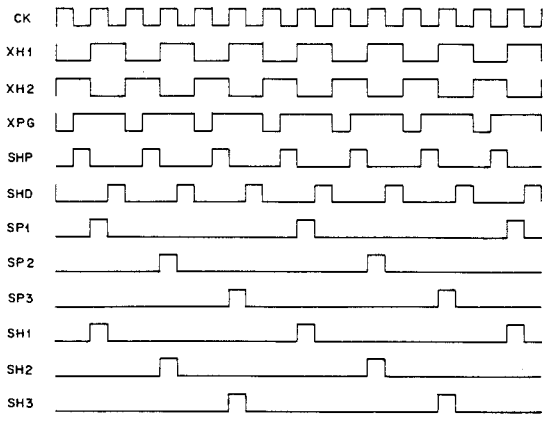
	HIGH (VDD) LEVEL	LOW (VSS) LEVEL
D1	※	
D2	1-CHIP COLOR	B/W, 3-CHIP COLOR
D3	FRAME	FIELD
D4	EIA (NTSC, PAL-M)	CCIR (PAL, SECAM)

※ Connect D1 to GND without ROM (ROM OFF)

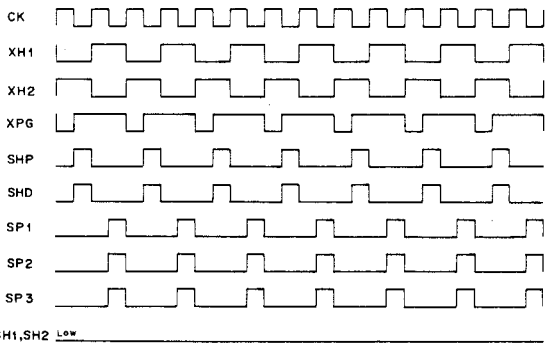
D1 – D4 : EXTERNAL ROM DATA INPUT

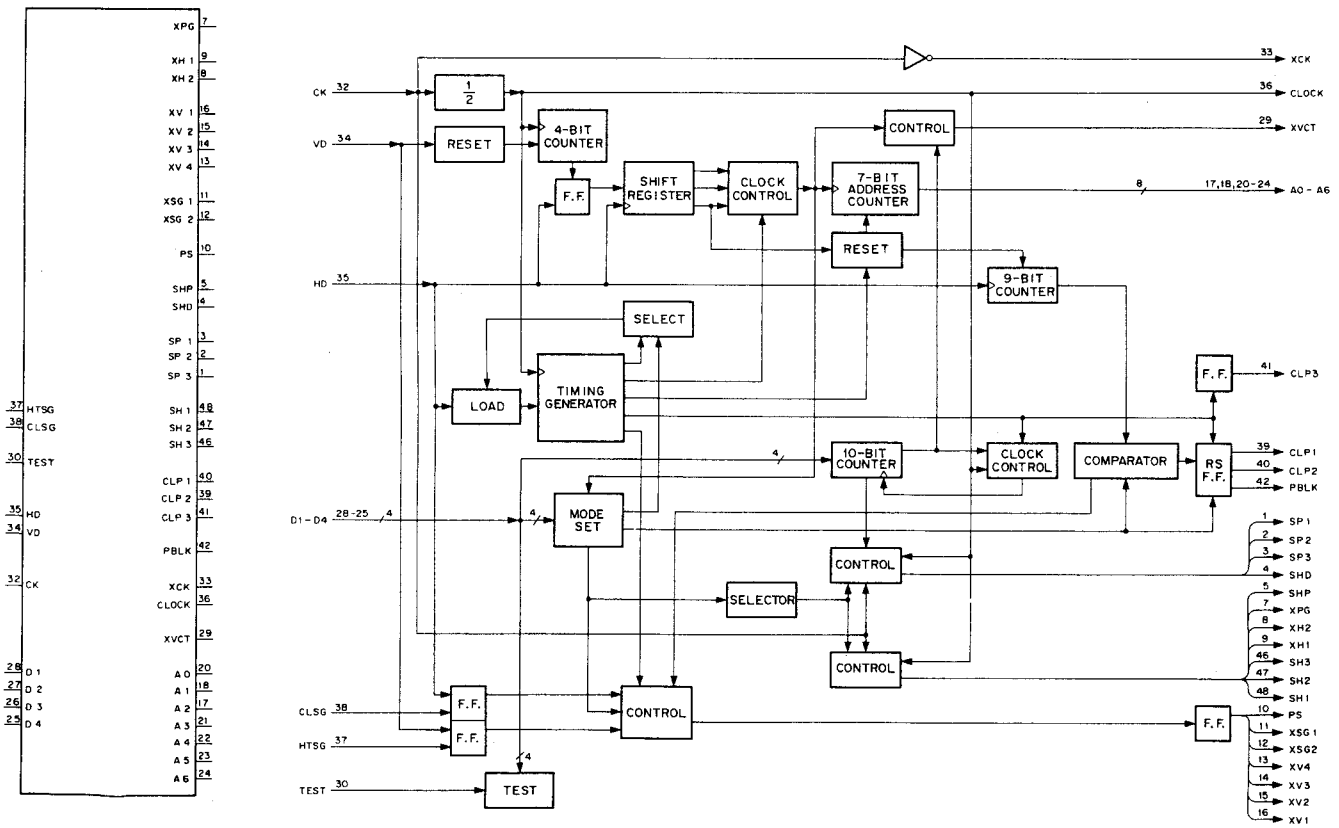
A0 – A6 : EXTERNAL ROM ADDRESS OUTPUT

1-CHIP COLOR

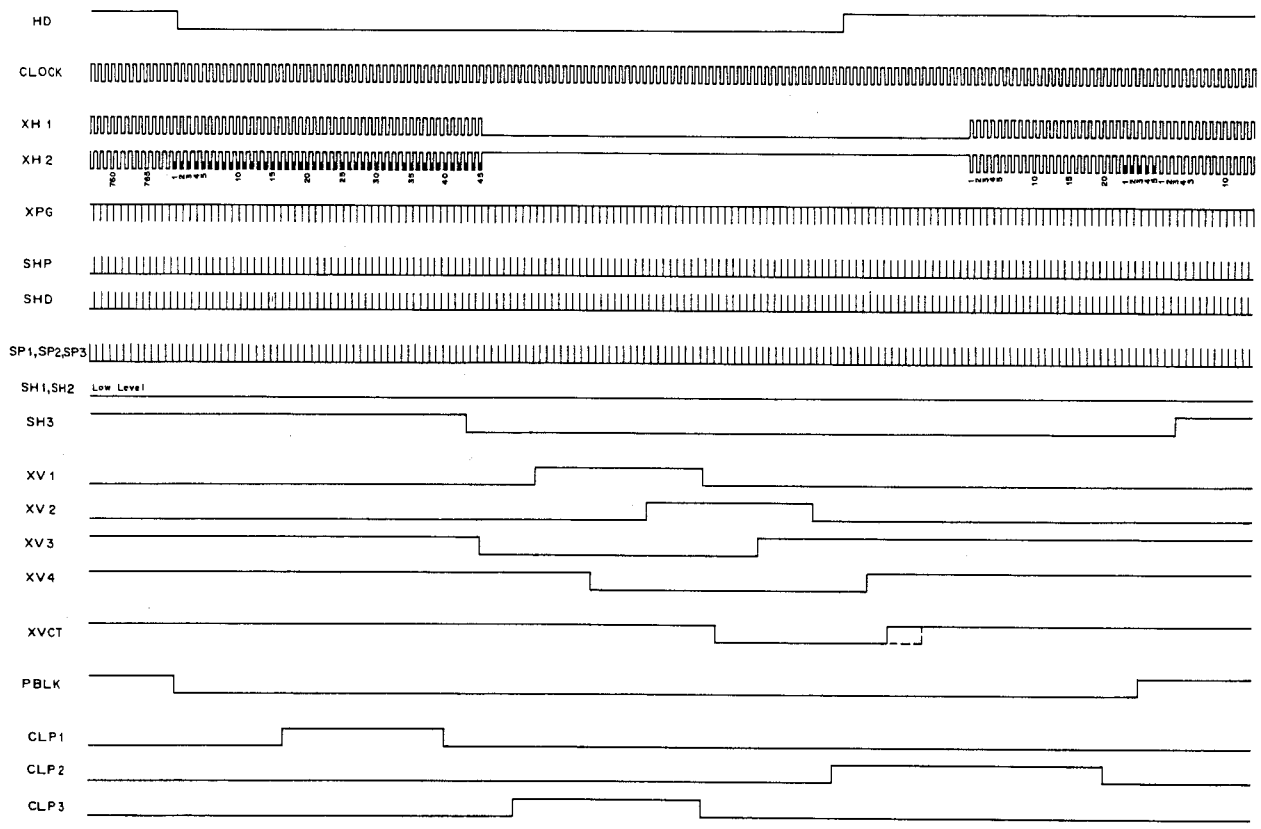


B/W, 3-CHIP COLOR

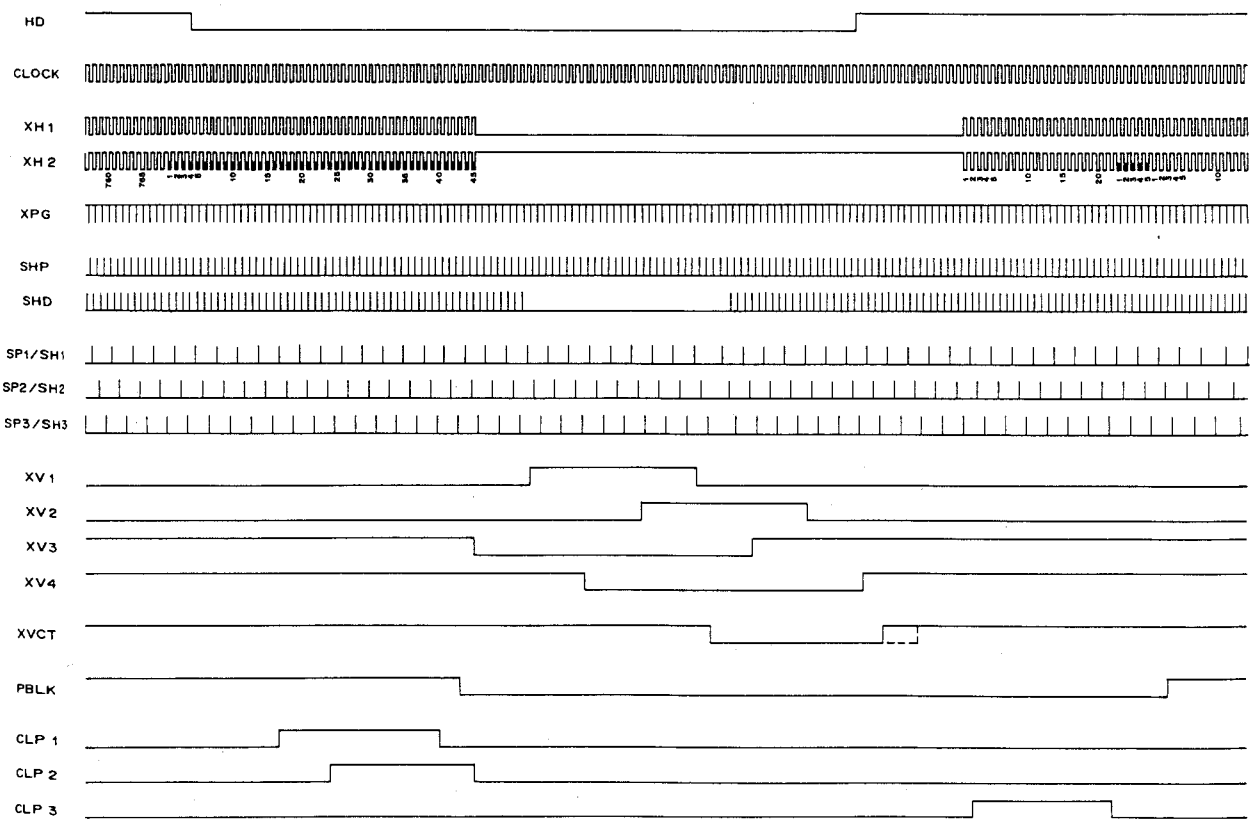




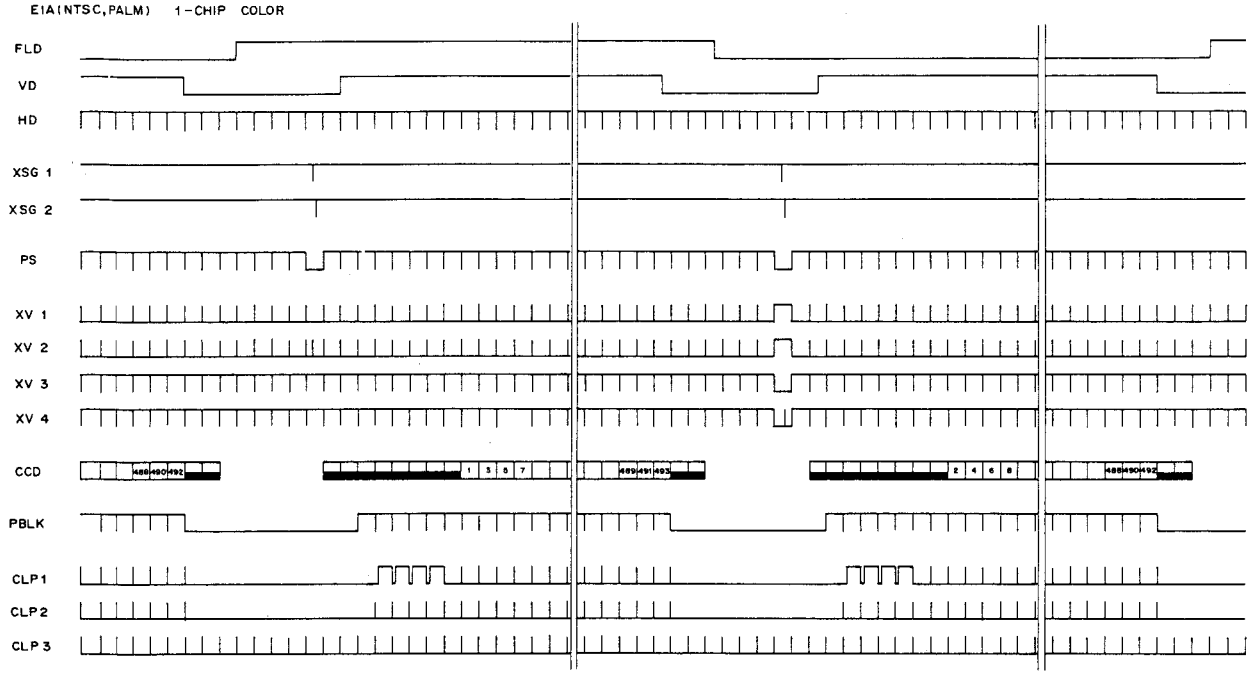
EIA (NTSC,PALM) B/W,3-CHIP COLOR



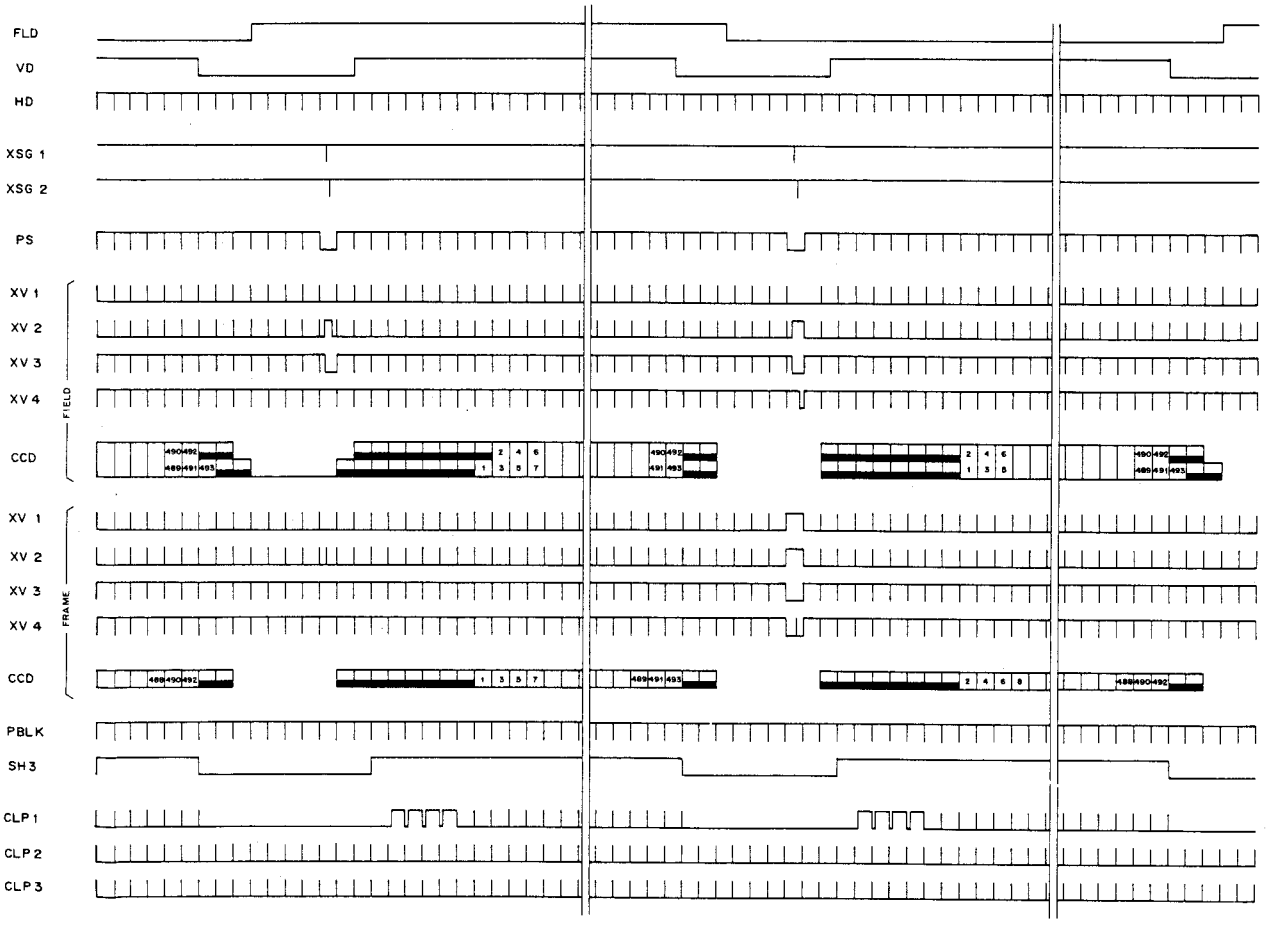
EIA(NTSC,PALM) 1-CHIP COLOR



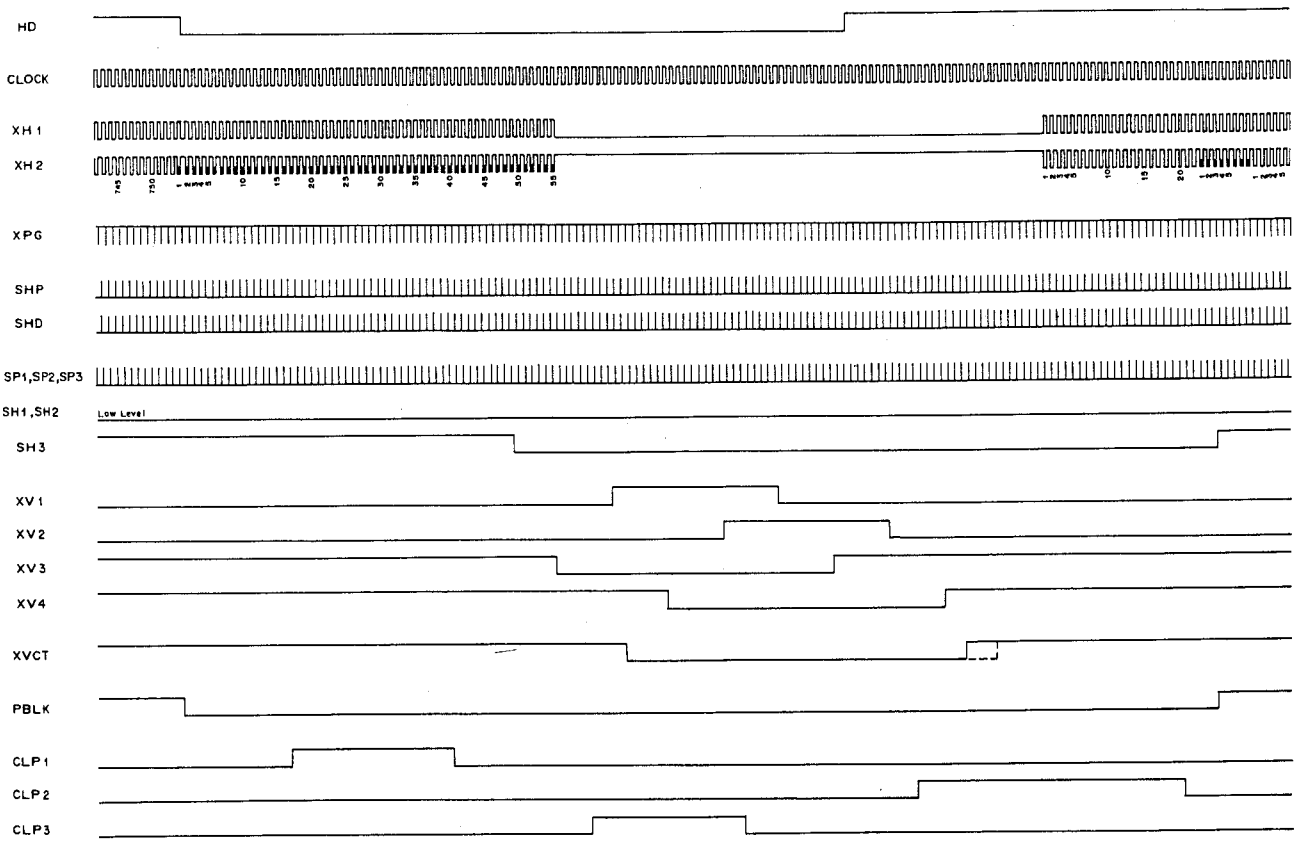
EIA(NTSC,PALM) 1-CHIP COLOR



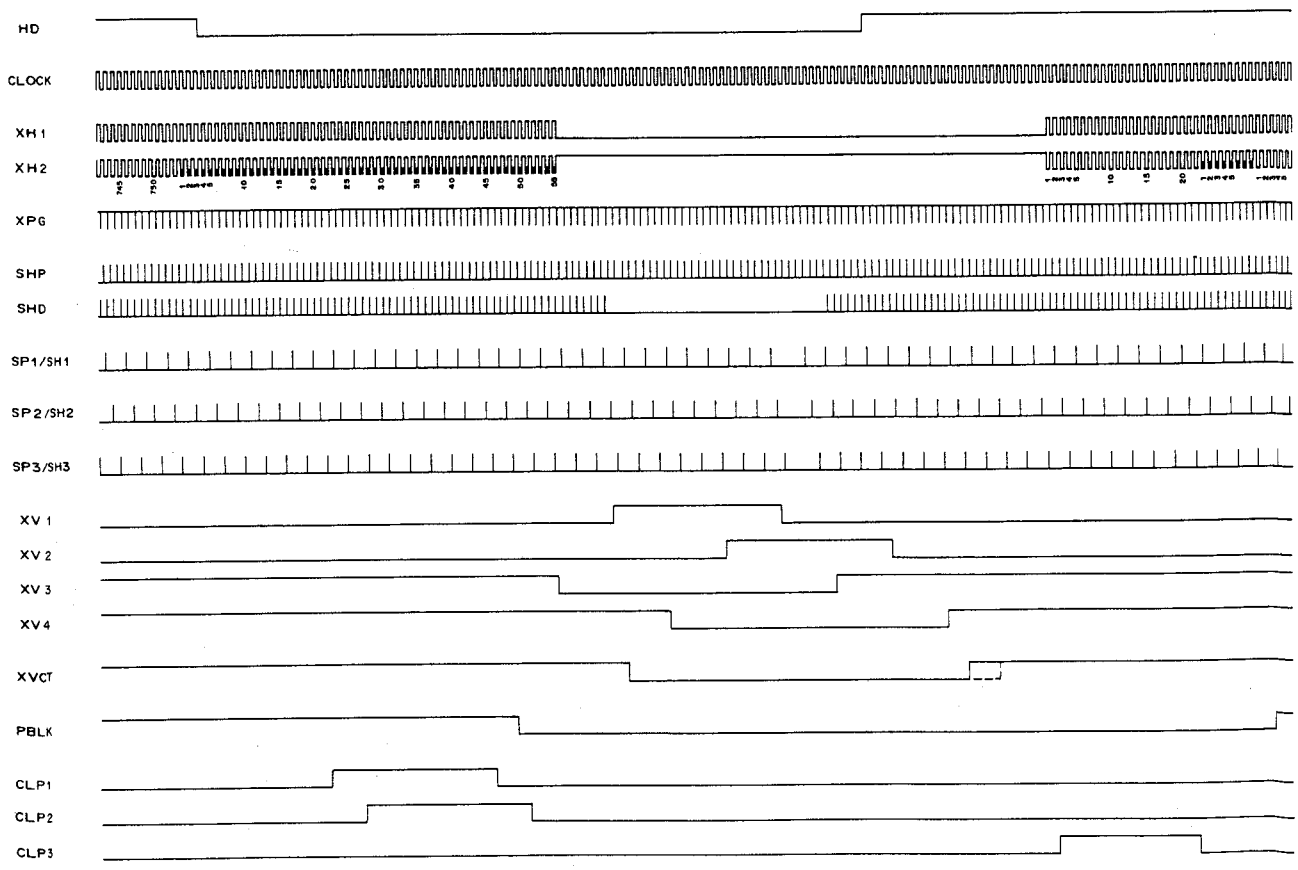
EIA(NTSC,PALM) B/W,3-CHIP COLOR



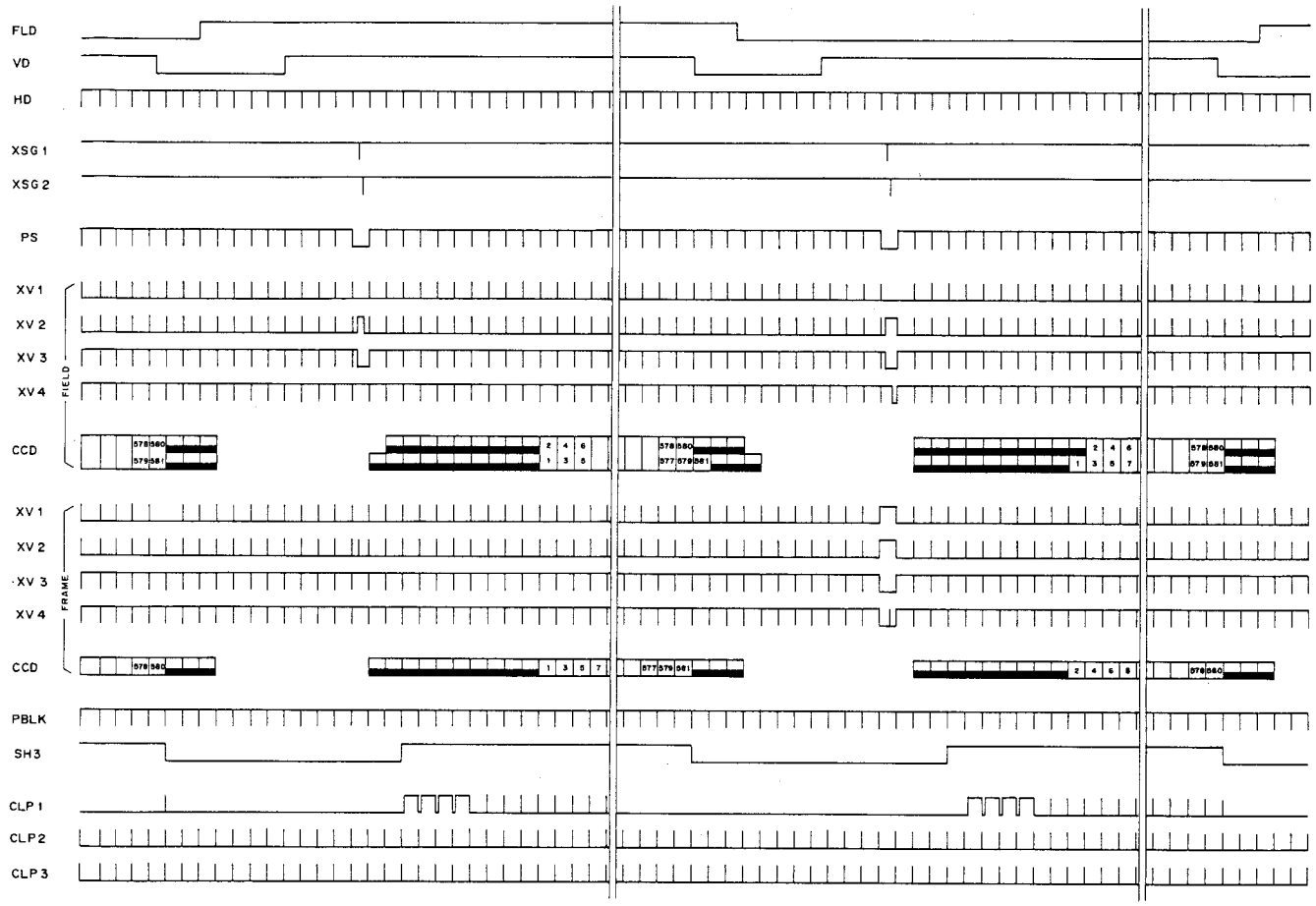
CCIR(PAL,SECAM) B/W,3CHIP COLOR



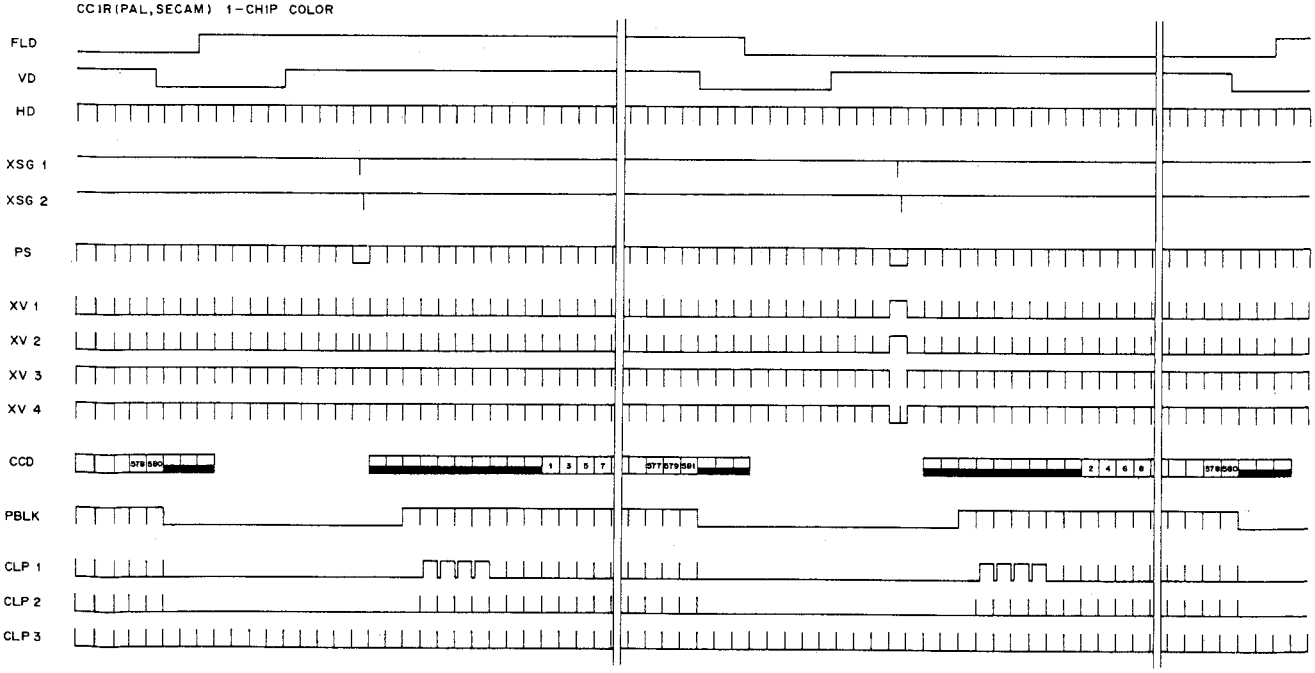
CCIR(PAL,SECAM) 1-CHIP COLOR



CCIR(PAL,SECAM) B/W,3-CHIP COLOR

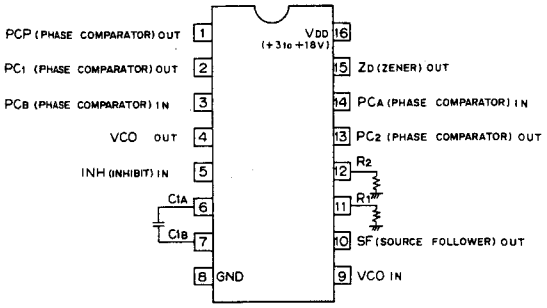


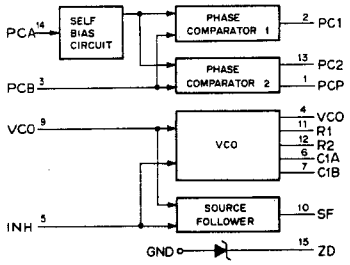
CCIR(PAL,SECAM) 1-CHIP COLOR



MC14046BF (MOTOROLA) FLAT PACKAGE
C-MOS PHASE LOCKED LOOP

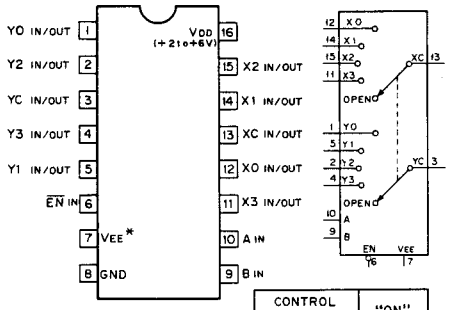
— TOP VIEW —





TC74HC4052AF (TOSHIBA) FLAT PACKAGE
C-MOS 4-CHANNEL MULTIPLEXER/DEMULTIPLEXER

— TOP VIEW —



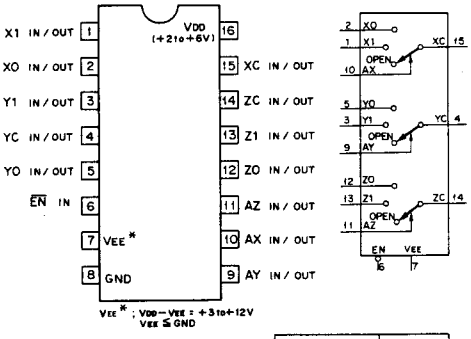
VEE* ; VDD − VEE = +3 to +12V

CONTROL INPUTS			"ON" CHANNEL
EN	B	A	
0	0	0	0
0	0	1	1
0	1	0	2
0	1	1	3
1	X	X	OPEN

0; LOW LEVEL
1; HIGH LEVEL
X; DON'T CARE.

TC74HC4053AF (TOSHIBA) FLAT PACKAGE
C-MOS 2-CHANNEL MULTIPLEXER/DEMULTIPLEXER

— TOP VIEW —



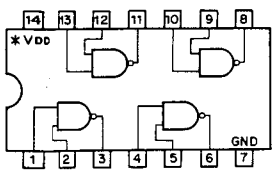
VEE* ; VDD − VEE = +3 to +12V
VEE ≤ GND

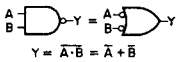
CONT. INPUTS		ON CHANNEL
EN	A (X,Y,Z)	
0	0	0
0	1	1
1	X	OPEN

0; LOW LEVEL
1; HIGH LEVEL
X; DON'T CARE.

TC74HC00AF (TOSHIBA) FLAT PACKAGE
C-MOS 2-INPUT NAND GATE

— TOP VIEW —





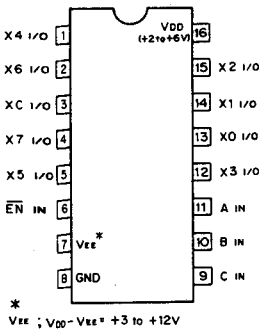
A	B	Y
0	0	1
0	1	1
1	0	1
1	1	0

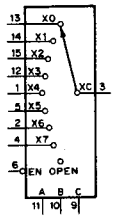
0; LOW LEVEL
1; HIGH LEVEL

*VDD AC, HC; +2 to +6V
HCT; +5V

TC74HC4051AF (TOSHIBA) FLAT PACKAGE
C-MOS 8-CHANNEL ANALOG MULTIPLEXER/DEMULTIPLEXER

— TOP VIEW —





CONTROL INPUTS				SELECTED CHANNEL
EN	SELECT			
	C	B	A	
0	0	0	0	X0
0	0	0	1	X1
0	0	1	0	X2
0	0	1	1	X3
0	1	0	0	X4
0	1	0	1	X5
0	1	1	0	X6
0	1	1	1	X7
1	X	X	X	OPEN

0; LOW LEVEL
1; HIGH LEVEL
X; DON'T CARE

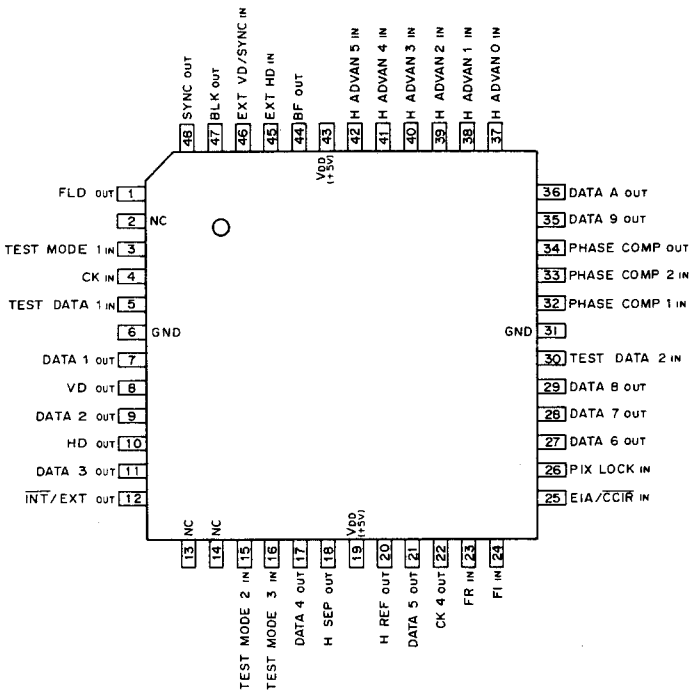
X0 to X7; ANALOG INPUTS/OUTPUTS
XC; COMMON INPUT/OUTPUT
A,B,C; CHANNEL SELECT INPUT
EN; ENABLE INPUT

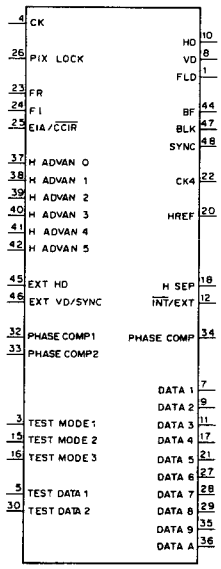
* VEE ; VDD − VEE = +3 to +12V

CXD1084Q-W (SONY) FLAT PACKAGE

C-MOS SYNC GENERATOR FOR CCD B/W CAMERA

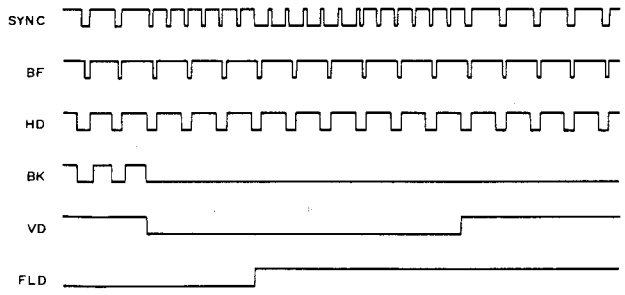
— TOP VIEW —



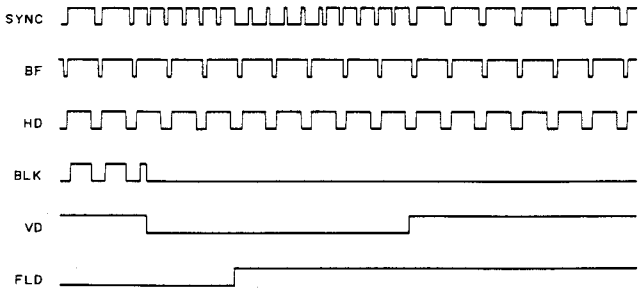


CK ; EIA = 910FH CCIR = 908FH
PIX LOCK ; PIXEL LOCK MODE SELECT
FR ; FIELD RESET MODE SELECT
FI ; FIELD INVERSION MODE SELECT
EXT HD ; EXTERNAL HD
EXT VD/SYNC ; EXTERNAL VD or SYNC
H ADVAN 0~5 ; H REF PULSE DELAY CONTROL DATA
CK4 ; QUARTER CK PULSE

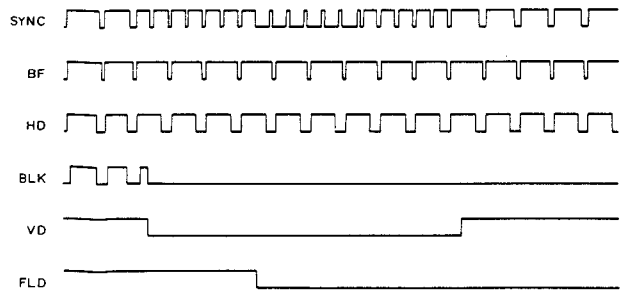
EIA (FIELD 1,3)



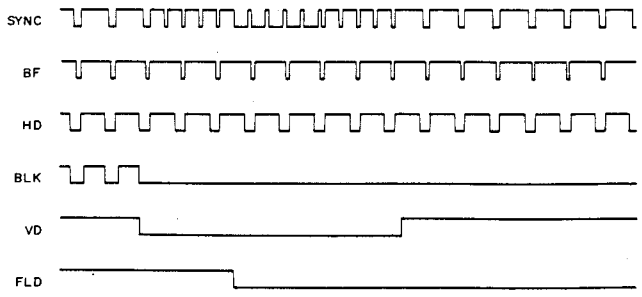
CCIR (FIELD 1,3)

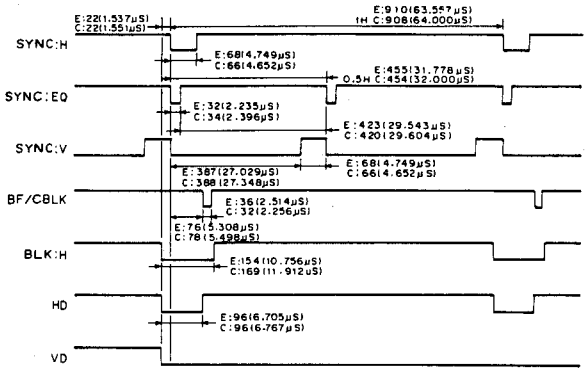


(FIELD 2,4)



(FIELD 2,4)





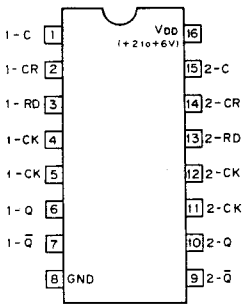
E ; EIA
C ; CCIR

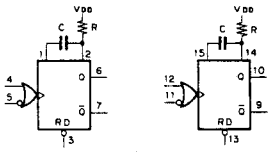
※ Values in parenthesis ( ) are on the basis of the following clocks.
EIA CK : 14.31818MHz
CCIR CK : 14.1875MHz

TC74HC4538F (TOSHIBA) FLAT PACKAGE

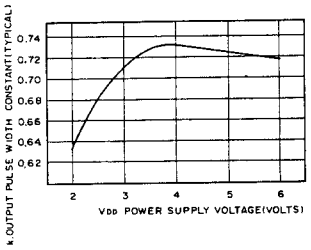
C-MOS DUAL RETRIGGERABLE/NON-RETRIGGERABLE MONOSTABLE MULTIVIBRATOR

– TOP VIEW –

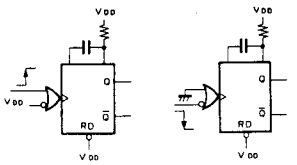




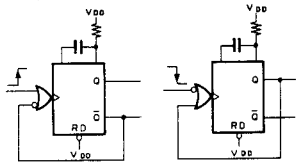
OUTPUT PULSE WIDTH = k·C·R



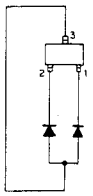
RETRIGGERABLE M.M.V



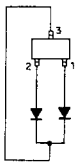
NON-RETRIGGERABLE M.M.V



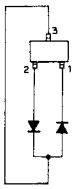
<Diode, Transistor>



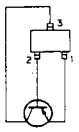
1S2835



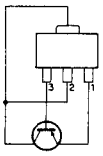
1S2837



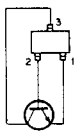
1SS123



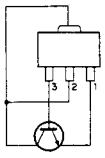
2SA1162
2SA1462



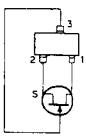
2SB804



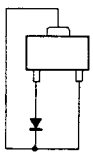
2SC2712
2SC3735



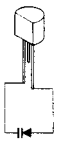
2SD1005



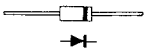
2SK300
2SK508



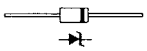
E10QS03
E10QS04



FC52M



1S1555
1SS119



RD5.1EL2

SECTION C
REPAIR PARTS

C-1. PARTS INFORMATION

1. **Safety Related Components Warning.**
   Components identified by shading marked with ⚠ on the schematic diagrams, exploded views and electrical spare parts list are critical to safe operation. Replace these components with Sony parts whose part numbers appear in this manual or in service bulletins and service manual supplements published by Sony.

2. Replacement Parts supplied from Sony Parts Center will sometimes have a different shape from the original parts. This is due to "accommodating the improved parts and/or engineering changes" or "standardization of genuine parts".
   This manual's exploded views and electrical spare parts list indicate the parts numbers of "the standardized genuine parts at present". Regarding engineering parts changes in our engineering department, refer to Sony service bulletins and service manual supplements.

3. Items marked " * " are not stocked since they are seldom required for routine service. Some delay should be anticipated when ordering these items.

4. Abbreviations

Ref.No.	Description	Ref.No.	Description
C??,CV??	CAPACITOR	CN??	CONNECTOR
CP??	COMBINATION PARTS	D??	DIODE
DL??	DELAY LINE	F??	FUSE
FL??	FILTER	IC??	IC
L??,LV??	INDUCTOR	M??	MOTOR
ME??	METER	PL??	LAMP
Q??	TRANSISTOR	R??,RV??	RESISTOR
RY??	RELAY	SW??	SWITCH
T??	TRANSFORMER	TH??	THERMISTOR
X??	CRYSTAL		

5. Units for Capacitors, Inductors and Resistors
   The following units are assumed in schematic diagrams and electrical parts list unless otherwise specified:
   Capacitors: micro farad
   Inductors: micro henry
   Resistors: ohm

C-2. ELECTRICAL PARTS LIST

C-2-1. BI-26 Board

Ref No. or Q'ty	Parts No.	Description
	*A-7520-429-A	MOUNTED PCB, BI-26
1pc	*1-563-936-11	HOUSING, CONNECTOR 2P
2pcs	1-563-940-11	TERMINAL, SOLDERLESS
2pcs	*1-574-867-11	WIRE, PVC (FLAT TYPE) (6-CORE)
C1	1-135-177-21	TANTAL. CHIP 1 10% 25V
C2	1-135-164-21	TANTAL. CHIP 22 10% 20V
C3	1-135-153-21	TANTAL. CHIP 2.2 10% 25V
C4	1-135-177-21	TANTAL. CHIP 1 10% 25V
C5, 6	1-163-033-00	CERAMIC CHIP 0.022 50V
C7	1-135-177-21	TANTAL. CHIP 1 10% 25V
C8	1-135-166-21	TANTAL. CHIP 47 10% 10V
C9	1-135-177-21	TANTAL. CHIP 1 10% 25V
C10, 11	1-164-232-11	CERAMIC CHIP 0.01 10% 100V
C12, 13	1-163-117-00	CERAMIC CHIP 100pF 5% 50V
C14	1-163-038-00	CERAMIC CHIP 0.1 25V
C15, 16	1-135-166-21	TANTAL. CHIP 47 10% 10V
C17	1-163-101-00	CERAMIC CHIP 22pF 5% 50V
C18	1-163-123-00	CERAMIC CHIP 180pF 5% 50V
C19	1-164-232-11	CERAMIC CHIP 0.01 10% 50V
C20	1-135-154-21	TANTAL. CHIP 3.3 10% 20V
C21	1-163-038-00	CERAMIC CHIP 0.1 25V
D1	8-719-104-34	1S2836
IC2	8-759-013-02	CXB0026AM
L1	1-410-713-31	CHIP 47
Q1	8-765-200-02	2SK300-3
Q2	8-729-112-65	2SA1462
Q3	8-729-140-47	2SC3735-L-B35
Q4	8-729-112-65	2SA1462
Q5, 6	8-729-140-47	2SC3735-L-B35
Q7	8-729-112-65	2SA1462
Q8	8-729-271-22	2SC2712-G
R1	1-216-084-00	METAL GLAZE CHIP 30K 5% 1/10W
R2	1-216-075-00	METAL GLAZE CHIP 12K 5% 1/10W
R3	1-216-039-00	METAL GLAZE CHIP 390 5% 1/10W
R4, 5	1-216-295-00	METAL GLAZE CHIP 0 5% 1/10W
R6	1-216-025-00	METAL GLAZE CHIP 100 5% 1/10W
R7	1-216-061-00	METAL GLAZE CHIP 3.3K 5% 1/10W
R8-10	1-216-097-00	METAL GLAZE CHIP 100K 5% 1/10W
R11	1-216-083-00	METAL GLAZE CHIP 27K 5% 1/10W
R12, 13	1-216-049-00	METAL GLAZE CHIP 1K 5% 1/10W
R14	1-216-308-00	METAL GLAZE CHIP 4.7 5% 1/10W
R15	1-216-005-00	METAL GLAZE CHIP 15 5% 1/10W
R16	1-216-121-00	METAL GLAZE CHIP 1M 5% 1/10W
R17	1-216-079-00	METAL GLAZE CHIP 18K 5% 1/10W
R18	1-216-093-00	METAL GLAZE CHIP 68K 5% 1/10W

C-2-2. CN-295 Board

Ref No. or Q'ty	Parts No.	Description
⚠	*A-7520-430-A	MOUNTED PCB, CN-295
1pc	*1-574-866-11	WIRE, PVC (FLAT TYPE) (14-CORE)
C1	1-163-038-00	CERAMIC CHIP 0.1 25V
C2	1-163-038-00	CERAMIC CHIP 0.1 25V
C3	1-163-101-00	CERAMIC CHIP 22pF 5% 50V
C4	1-163-101-00	CERAMIC CHIP 22pF 5% 50V
C5	1-163-101-00	CERAMIC CHIP 22pF 5% 50V
C6	1-163-038-00	CERAMIC CHIP 0.1 25V
C7	1-163-009-11	CERAMIC CHIP 0.001 10% 50V
C8	1-163-125-00	CERAMIC CHIP 220pF 5% 50V
C9	1-163-125-00	CERAMIC CHIP 220pF 5% 50V
C10	1-163-125-00	CERAMIC CHIP 220pF 5% 50V
C11	1-163-125-00	CERAMIC CHIP 220pF 5% 50V
C12	1-163-125-00	CERAMIC CHIP 220pF 5% 50V
C13	1-163-125-00	CERAMIC CHIP 220pF 5% 50V
D1	8-719-200-36	E10QS04
⚠F1	1-532-777-21	MICRO (SECONDARY) 125V 1.2A
L1	1-410-697-21	CHIP 2.2
L2	1-410-697-21	CHIP 2.2
L3	1-410-180-51	CHIP 0.1
L4	1-410-180-51	CHIP 0.1
L5	1-410-180-51	CHIP 0.1
L6	1-410-180-51	CHIP 0.1
L7	1-410-180-51	CHIP 0.1
L8	1-410-180-51	CHIP 0.1
L9	1-410-180-51	CHIP 0.1
L10	1-410-180-51	CHIP 0.1
L11	1-410-180-51	CHIP 0.1
L12	1-410-180-51	CHIP 0.1

Ref No. or Q'ty	Parts No.	Description <Note>
C-2-3. DR-83 Borad		
	*A-7513-974-A	COMPLETE PCB, DR-83
1pc	*1-568-602-11	PIN, LINE ANGLE (SIL) 5P
1pc	*1-568-603-11	PIN, LINE ANGLE (SIL) 6P
1pc	*1-568-605-11	PIN, LINE ANGLE (SIL) 9P
C1	1-163-038-00	CERAMIC CHIP 0.1 25V
C2	1-135-079-21	TANTAL. CHIP 3.3 10% 35V
C3	1-135-159-21	TANTAL. CHIP 10 10% 20V
C4	1-163-038-00	CERAMIC CHIP 0.1 25V
C5	1-135-079-21	TANTAL. CHIP 3.3 10% 35V
C6	1-135-159-21	TANTAL. CHIP 10 10% 20V
C7	1-135-177-21	TANTAL. CHIP 1 10% 25V
C8	1-135-154-21	TANTAL. CHIP 3.3 10% 20V
C9	1-163-038-00	CERAMIC CHIP 0.1 25V
C10	1-135-154-21	TANTAL. CHIP 3.3 10% 20V
C11	1-135-154-21	TANTAL. CHIP 3.3 10% 20V
C12	1-135-079-21	TANTAL. CHIP 3.3 10% 35V
C13	1-164-161-11	CERAMIC CHIP 2200pF 10% 100V
C14	1-163-232-11	CERAMIC CHIP 0.01 10% 100V
C15	1-163-035-00	CERAMIC CHIP 0.047 50V
C16	1-135-079-21	TANTAL. CHIP 3.3 10% 35V
C17	1-135-154-21	TANTAL. CHIP 3.3 10% 20V
C18	1-135-154-21	TANTAL. CHIP 3.3 10% 20V
C19	1-135-154-21	TANTAL. CHIP 3.3 10% 20V
C20	1-135-145-11	TANTAL. CHIP 0.47 20% 35V
C21	1-135-145-11	TANTAL. CHIP 0.47 20% 35V
C22	1-135-145-11	TANTAL. CHIP 0.47 20% 35V
C23	1-135-145-11	TANTAL. CHIP 0.47 20% 35V
C24	1-135-154-21	TANTAL. CHIP 3.3 10% 20V
C25	1-135-154-21	TANTAL. CHIP 3.3 10% 20V
C26	1-135-162-21	TANTAL. CHIP 33 10% 6.3V
C27	1-163-109-00	CERAMIC CHIP 47pF 5% 50V <3>
	1-163-113-00	CERAMIC CHIP 68pF 5% 50V <4>
C28	1-163-117-00	CERAMIC CHIP 100pF 5% 50V <2>
C29	1-163-117-00	CERAMIC CHIP 100pF 5% 50V <2>
C30	1-135-177-21	TANTAL. CHIP 1 10% 25V <2>
D1	8-719-104-34	1S2836
D2	8-719-104-34	1S2836
D3	8-719-400-18	MA152WK
D4	8-719-104-34	1S2836
D5	8-719-104-34	1S2836
D6	8-719-800-76	1SS123
D7	8-719-104-34	1S2836
D8	8-719-104-34	1S2836
D9	8-719-400-18	MA152WK
IC1	8-752-031-03	CXA1065M
IC2	8-759-008-45	MC74HC4538F <2>
IC3	8-752-324-14	CXD1141M
L1	1-410-713-31	CHIP 47
L2	1-410-713-31	CHIP 47

Ref No.	Parts No.	Description <Note>
Q1	8-729-271-22	2SC2712-G
Q2	8-729-216-22	2SA1162
Q3	8-729-271-22	2SC2712-G
Q4	8-729-271-22	2SC2712-G
Q5	8-729-271-22	2SC2712-G
Q6	8-729-271-22	2SC2712-G
Q7	8-729-271-22	2SC2712-G
Q8	8-729-216-22	2SA1162
Q9	8-729-104-25	2SB804-AV
Q10	8-729-103-72	2SD1005-BV
R1	1-216-067-00	METAL GLAZE CHIP 5.6K 5% 1/10W
R2	1-216-099-00	METAL GLAZE CHIP 120K 5% 1/10W
R3	1-216-084-00	METAL GLAZE CHIP 30K 5% 1/10W
R4	1-216-093-00	METAL GLAZE CHIP 68K 5% 1/10W
R5	1-216-077-00	METAL GLAZE CHIP 15K 5% 1/10W
R6	1-216-091-00	METAL GLAZE CHIP 56K 5% 1/10W
R7	1-216-083-00	METAL GLAZE CHIP 27K 5% 1/10W
R8	1-216-107-00	METAL GLAZE CHIP 270K 5% 1/10W
R9	1-216-748-11	METAL GLAZE CHIP 39K 1% 1/10W
R10	1-216-077-00	METAL GLAZE CHIP 15K 5% 1/10W
R11	1-216-077-00	METAL GLAZE CHIP 15K 5% 1/10W
R12	1-216-121-00	METAL GLAZE CHIP 1M 5% 1/10W
R13	1-216-073-00	METAL GLAZE CHIP 10K 5% 1/10W
R14	1-216-085-00	METAL GLAZE CHIP 33K 5% 1/10W
R15	1-216-081-00	METAL GLAZE CHIP 22K 5% 1/10W
R16	1-216-005-00	METAL GLAZE CHIP 15 5% 1/10W
R17	1-216-005-00	METAL GLAZE CHIP 15 5% 1/10W
R18	1-216-109-00	METAL GLAZE CHIP 330K 5% 1/10W
R19	1-216-109-00	METAL GLAZE CHIP 330K 5% 1/10W
R20	1-216-109-00	METAL GLAZE CHIP 330K 5% 1/10W
R21	1-216-109-00	METAL GLAZE CHIP 330K 5% 1/10W
R22	1-216-067-00	METAL GLAZE CHIP 5.6K 5% 1/10W
R23	1-216-101-00	METAL GLAZE CHIP 150K 5% 1/10W
R24	1-216-097-00	METAL GLAZE CHIP 100K 5% 1/10W
R25	1-216-097-00	METAL GLAZE CHIP 100K 5% 1/10W
R26	1-216-097-00	METAL GLAZE CHIP 100K 5% 1/10W
R27	1-216-097-00	METAL GLAZE CHIP 100K 5% 1/10W
R28	1-216-083-00	METAL GLAZE CHIP 27K 5% 1/10W <2>
R29	1-216-097-00	METAL GLAZE CHIP 100K 5% 1/10W
R30	1-216-073-00	METAL GLAZE CHIP 10K 5% 1/10W
R31	1-216-075-00	METAL GLAZE CHIP 12K 5% 1/10W <2>
R32	1-216-057-00	METAL GLAZE CHIP 2.2K 5% 1/10W <3>
R33	1-216-097-00	METAL GLAZE CHIP 100K 5% 1/10W
RV1	1-230-873-11	ADJ, METAL GLAZE 47K
SW1	1-571-980-11	DIGITAL (ROTARY)

Notes <2>: Only be used when P/N suffix of DR-83 PC board is 12.
<3>: No mounted is possible when P/N suffix of DR-83 PC board is 11.
<4>: There are parts that R32 is open and only C27 is mounted when P/N suffix of DR-83 PC board is 11.

C-2-4. EN-72 Board

Ref No. or Q'ty	Parts No.	Description
	*A-7513-976-A	COMPLETE PCB, EN-72 <N>
	*A-7513-982-A	COMPLETE PCB, EN-72P <P>
1pc	*1-568-603-11	PIN, LINE ANGLE (SIL) 6P
2pcs	*1-568-604-11	PIN, LINE ANGLE (SIL) 7P
C1, 2	1-135-166-21	TANTAL. CHIP 47 10% 10V
C3	1-135-177-21	TANTAL. CHIP 1 10% 25V
C4	1-163-038-00	CERAMIC CHIP 0.1 25V
C5	1-135-177-21	TANTAL. CHIP 1 10% 25V
C6	1-163-038-00	CERAMIC CHIP 0.1 25V
C7	1-163-093-00	CERAMIC CHIP 10pF 5% 50V
C8	1-164-326-91	CERAMIC CHIP 0.47 16V
C9	1-163-038-00	CERAMIC CHIP 0.1 25V
C10, 11	1-135-177-21	TANTAL. CHIP 1 10% 25V
C12	1-163-232-00	CERAMIC CHIP 0.01 10% 100V
C13	1-135-161-21	TANTAL. CHIP 22 10% 10V
C14	1-163-038-00	CERAMIC CHIP 0.1 25V
C15	1-163-093-00	CERAMIC CHIP 10pF 5% 50V
C16	1-163-038-00	CERAMIC CHIP 0.1 25V
C17	1-163-009-11	CERAMIC CHIP 0.001 10% 50V
C18	1-163-093-00	CERAMIC CHIP 10pF 5% 50V
C19	1-164-326-11	CERAMIC CHIP 0.47 16V
C20	1-135-162-21	TANTAL. CHIP 33 10% 6.3V
C21	1-135-157-21	TANTAL. CHIP 10 10% 6.3V
C22	1-163-093-00	CERAMIC CHIP 10pF 5% 50V
C23	1-135-166-21	TANTAL. CHIP 47 10% 10V
C24	1-135-161-21	TANTAL. CHIP 22 10% 10V
C25	1-163-129-00	CERAMIC CHIP 330pF 5% 50V
C26	1-135-157-21	TANTAL. CHIP 10 10% 6.3V
C27	1-163-038-00	CERAMIC CHIP 0.1 25V
C28-30	1-163-109-00	CERAMIC CHIP 47pF 5% 50V
C31	1-163-093-00	CERAMIC CHIP 10pF 5% 50V
C32	1-163-109-00	CERAMIC CHIP 47pF 5% 50V <P>
C33	1-135-161-21	TANTAL. CHIP 22 10% 10V
C37	1-163-095-00	CERAMIC CHIP 12pF 5% 50V <P>
C38	1-163-093-00	CERAMIC CHIP 10pF 5% 50V <P>
C40	1-135-162-21	TANTAL. CHIP 33 10% 6.3V
C41	1-163-091-00	CERAMIC CHIP 8pF 50V <P>
C45	1-163-100-00	CERAMIC CHIP 20pF 5% 50V <N>
	1-163-098-00	CERAMIC CHIP 16pF 5% 50V <P>
CV1	1-141-412-11	TRIMMER 20pF <P>
D1-4	8-719-400-18	MA152WK
DL1	1-415-448-21	DELAY LINE
FL1	1-235-394-11	FILTER, LOW PASS (YH) <N>
	1-235-442-11	FILTER, LOW PASS (YH) <P>
IC1	8-759-011-65	MC74HC4053F
IC2	8-752-031-97	CXA1072Q-Z
IC3	8-759-983-10	MAX452CSA
IC4	8-759-908-39	CX-7998
IC5	8-759-206-55	TC74HC4538F
IC6	8-757-930-11	CX-7930A

Ref No.	Parts No.	Description <Note>
L1, 3	1-410-693-21	CHIP 1
L4	1-410-709-31	CHIP 22
L6	1-410-717-31	CHIP 100
Q3	8-729-271-22	2SC2712-G <P>
Q4	8-729-116-64	2SK508-K51
R1, 2	1-216-083-00	METAL GLAZE CHIP 27K 5% 1/10W
R3-6	1-216-073-00	METAL GLAZE CHIP 10K 5% 1/10W
R11	1-216-083-00	METAL GLAZE CHIP 27K 5% 1/10W <P>
R12	1-216-079-00	METAL GLAZE CHIP 18K 5% 1/10W
R20, 21	1-216-049-00	METAL GLAZE CHIP 1K 5% 1/10W
R22, 23	1-216-083-00	METAL GLAZE CHIP 27K 5% 1/10W
R24	1-216-093-00	METAL GLAZE CHIP 68K 5% 1/10W
R25	1-216-748-11	METAL GLAZE CHIP 39K 1% 1/10W
R27	1-216-097-00	METAL GLAZE CHIP 100K 5% 1/10W
R30, 31	1-216-049-00	METAL GLAZE CHIP 1K 5% 1/10W
R32	1-216-022-00	METAL GLAZE CHIP 75 5% 1/10W
R33	1-216-097-00	METAL GLAZE CHIP 100K 5% 1/10W
R35	1-216-073-00	METAL GLAZE CHIP 10K 5% 1/10W
R36-38	1-216-057-00	METAL GLAZE CHIP 2.2K 5% 1/10W
R39	1-216-121-00	METAL GLAZE CHIP 1M 5% 1/10W
R40	1-216-033-00	METAL GLAZE CHIP 220 5% 1/10W
R41	1-216-073-00	METAL GLAZE CHIP 10K 5% 1/10W <P>
R43	1-216-073-00	METAL GLAZE CHIP 10K 5% 1/10W
R44	1-216-121-00	METAL GLAZE CHIP 1M 5% 1/10W <P>
R45	1-216-121-00	METAL GLAZE CHIP 1M 5% 1/10W
R46, 47	1-216-033-00	METAL GLAZE CHIP 220 5% 1/10W <N>
R48	1-216-057-00	METAL GLAZE CHIP 2.2K 5% 1/10W <P>
R49	1-216-053-00	METAL GLAZE CHIP 1.5K 5% 1/10W <P>
R50	1-216-033-00	METAL GLAZE CHIP 220 5% 1/10W <P>
R51, 53	1-216-073-00	METAL GLAZE CHIP 10K 5% 1/10W <P>
R55	1-216-051-00	METAL GLAZE CHIP 1.2K 5% 1/10W
R56	1-216-097-00	METAL GLAZE CHIP 100K 5% 1/10W <N>
R61	1-216-049-00	METAL GLAZE CHIP 1K 5% 1/10W
R63	1-216-049-00	METAL GLAZE CHIP 1K 5% 1/10W <N>
R65	1-216-049-00	METAL GLAZE CHIP 1K 5% 1/10W <P>
R66	1-216-049-00	METAL GLAZE CHIP 1K 5% 1/10W <N>
R67	1-216-047-00	METAL GLAZE CHIP 820 5% 1/10W
RV1-9	1-230-873-11	ADJ, METAL GLAZE 47K
RV10	1-230-873-11	ADJ, METAL GLAZE 47K <P>
RV11	1-230-871-11	ADJ, METAL GLAZE 22K
RV12	1-230-868-11	ADJ, METAL GLAZE 2.2K
SW1	1-571-020-21	DIP
X1	1-567-733-11	VIBRATOR, CRYSTAL 17.734MHz <P>

Notes <N>: For XC-711(UCJ)
<P>: For XC-711P(EK)

Ref No. or Q'ty	Parts No.	Description <Note>
C-2-5.	MB-222 Board	
	*A-7513-973-A	COMPLETE PCB, MB-222
2pcs	*1-540-092-11	SOCKET, SIL 3P
1pc	*1-540-093-11	SOCKET, SIL 4P
3pcs	*1-540-094-11	SOCKET, SIL 5P
3pcs	*1-540-095-11	SOCKET, SIL 6P
6pcs	*1-540-096-11	SOCKET, SIL 7P
5pcs	*1-540-097-11	SOCKET, SIL 9P
C1	1-163-038-00	CERAMIC CHIP 0.1 25V
C2	1-135-166-21	TANTAL. CHIP 47 10% 10V
C3	1-135-079-21	TANTAL. CHIP 3.3 10% 35V
C4	1-135-159-21	TANTAL. CHIP 10 10% 20V
C5	1-135-161-21	TANTAL. CHIP 22 10% 10V
C6	1-124-472-11	ELECT 470 20% 10V
C7	1-135-166-21	TANTAL. CHIP 47 10% 10V
C8	1-135-166-21	TANTAL. CHIP 47 10% 10V
C9	1-135-166-21	TANTAL. CHIP 47 10% 10V
C10	1-124-472-11	ELECT 470 20% 10V
C11	1-135-159-21	TANTAL. CHIP 10 10% 20V
C12	1-163-117-00	CERAMIC CHIP 100pF 5% 50V
C13	1-135-159-21	TANTAL. CHIP 10 10% 20V
C14	1-135-161-21	TANTAL. CHIP 22 10% 10V
C15	1-163-038-00	CERAMIC CHIP 0.1 25V
C16	1-135-161-21	TANTAL. CHIP 22 10% 10V
C17	1-135-159-21	TANTAL. CHIP 10 10% 20V
C18	1-135-166-21	TANTAL. CHIP 47 10% 10V
C19	1-163-117-00	CERAMIC CHIP 100pF 5% 50V
C20	1-102-820-00	CERAMIC 330pF 5% 50V <1>
	1-163-129-00	CERAMIC CHIP 330pF 5% 50V <2>
D1	8-719-101-50	RD5.1E-L <1>
	8-719-105-82	RD5.1M-B2 <2>
D2	8-719-911-19	1SS119 <1>
	8-719-400-18	MA152WK <2>
IC1	8-759-032-01	MC74HC00AF
L2	1-410-709-31	CHIP 22
L3	1-410-709-31	CHIP 22
L4	1-410-709-31	CHIP 22
L5	1-410-709-31	CHIP 22
L9	1-410-709-31	CHIP 22
PU1	1-466-155-11	CONVERTER UNIT, DC-DC (CD-110)
Q1	8-729-216-22	2SA1162
Q2	8-729-216-22	2SA1162
Q3	8-729-216-22	2SA1162
Q4	8-729-271-22	2SC2712-G
Q5	8-729-271-22	2SC2712-G
Q6	8-729-271-22	2SC2712-G
Q7	8-729-271-22	2SC2712-G
Q8	8-729-216-22	2SA1162

Ref No.	Parts No.	Description <Note>
R5	1-216-022-00	METAL GLAZE CHIP 75 5% 1/10W
R6	1-216-022-00	METAL GLAZE CHIP 75 5% 1/10W
R7	1-216-295-00	METAL GLAZE CHIP 0 5% 1/10W
R8	1-216-065-00	METAL GLAZE CHIP 4.7K 5% 1/10W
R9	1-216-085-00	METAL GLAZE CHIP 33K 5% 1/10W
R10	1-216-049-00	METAL GLAZE CHIP 1K 5% 1/10W
R11	1-216-095-00	METAL GLAZE CHIP 82K 5% 1/10W
R12	1-216-085-00	METAL GLAZE CHIP 33K 5% 1/10W
R13	1-216-065-00	METAL GLAZE CHIP 4.7K 5% 1/10W
R14	1-216-077-00	METAL GLAZE CHIP 15K 5% 1/10W
R15	1-216-698-11	METAL FILM CHIP 91K 0.5% 1/10W
R16	1-216-077-00	METAL GLAZE CHIP 15K 5% 1/10W
R17	1-216-013-00	METAL GLAZE CHIP 33 5% 1/10W
R18	1-216-029-00	METAL GLAZE CHIP 150 5% 1/10W
R19	1-216-065-00	METAL GLAZE CHIP 4.7K 5% 1/10W
R20	1-216-073-00	METAL GLAZE CHIP 10K 5% 1/10W
R21	1-216-029-00	METAL GLAZE CHIP 150 5% 1/10W
R22	1-216-065-00	METAL GLAZE CHIP 4.7K 5% 1/10W
R23	1-216-073-00	METAL GLAZE CHIP 10K 5% 1/10W
R24	1-216-029-00	METAL GLAZE CHIP 150 5% 1/10W
R25	1-216-057-00	METAL GLAZE CHIP 2.2K 5% 1/10W
R26	1-216-049-00	METAL GLAZE CHIP 1K 5% 1/10W
R27	1-216-105-00	METAL GLAZE CHIP 220K 5% 1/10W
R28	1-216-097-00	METAL GLAZE CHIP 100K 5% 1/10W
R29	1-216-037-00	METAL GLAZE CHIP 330 5% 1/10W
R31	1-216-049-00	METAL GLAZE CHIP 1K 5% 1/10W
R32	1-216-065-00	METAL GLAZE CHIP 4.7K 5% 1/10W
R33	1-249-429-11	CARBON 10K 5% 1/4W <1>
	1-216-073-00	METAL GLAZE CHIP 10K 5% 1/10W <2>

Notes <1>: When P/N suffix of MB-222 PC board is 11.
<2>: When P/N suffix of MB-222 PC board are 12 and 13.

C-2-6. MD-61 Board

Ref No. or Q'ty	Parts No.	Description <Note>
	*A-7513-977-A	COMPLETE PCB, MD-61
2pcs	*1-568-602-11	PIN, LINE ANGLE (SIL) 5P
1pc	*1-568-604-11	PIN, LINE ANGLE (SIL) 7P
C1-3	1-135-161-21	TANTAL. CHIP 22 10% 10V
C4	1-135-157-21	TANTAL. CHIP 10 10% 6.3V
C5	1-163-093-00	CERAMIC CHIP 10pF 5% 50V
C7, 8	1-135-161-21	TANTAL. CHIP 22 10% 10V
C9	1-135-166-21	TANTAL. CHIP 47 10% 10V
C10	1-135-157-21	TANTAL. CHIP 10 10% 6.3V
C11	1-135-161-21	TANTAL. CHIP 22 10% 10V
C12	1-135-157-21	TANTAL. CHIP 10 10% 6.3V
C13	1-163-093-00	CERAMIC CHIP 10pF 5% 50V
C14	1-135-162-21	TANTAL. CHIP 33 10% 6.3V
C15	1-135-157-21	TANTAL. CHIP 10 10% 6.3V
C16	1-164-326-11	CERAMIC CHIP 0.47 16V
C17	1-135-162-21	TANTAL. CHIP 33 10% 6.3V
C18	1-135-157-21	TANTAL. CHIP 10 10% 6.3V
C19, 20	1-135-177-21	TANTAL. CHIP 1 10% 25V
C21	1-135-162-21	TANTAL. CHIP 33 10% 6.3V
C22	1-135-157-21	TANTAL. CHIP 10 10% 6.3V
C23	1-164-326-11	CERAMIC CHIP 0.47 16V
C24	1-135-161-21	TANTAL. CHIP 22 10% 10V
C25-27	1-135-157-21	TANTAL. CHIP 10 10% 6.3V
C28	1-163-038-00	CERAMIC CHIP 0.1 25V
D1-3	8-719-400-18	MA152WK
FL1-3	1-235-999-21	FILTER, LOW PASS
IC1	8-759-605-63	CXA1297M
IC2	8-759-100-95	uPC324G2
IC3	8-759-011-65	MC74HC4053F
IC4	8-759-011-64	MC74HC4052F
IC5	8-759-605-63	CXA1297M
IC6	8-759-100-95	uPC324G2
L1, 2	1-410-693-21	CHIP 1
Q1-13	8-729-271-22	2SC2712-G
R1	1-216-085-00	METAL GLAZE CHIP 33K 5% 1/10W
R2	1-216-084-00	METAL GLAZE CHIP 30K 5% 1/10W
R3	1-216-639-11	METAL FILM CHIP 330 0.5% 1/10W
R4	1-216-651-11	METAL FILM CHIP 1K 0.5% 1/10W
R5	1-216-056-00	METAL GLAZE CHIP 2K 5% 1/10W
R6	1-216-651-11	METAL FILM CHIP 1K 0.5% 1/10W
R7	1-216-645-11	METAL FILM CHIP 560 0.5% 1/10W
R8	1-216-627-11	METAL FILM CHIP 100 0.5% 1/10W
R9	1-216-651-11	METAL FILM CHIP 1K 0.5% 1/10W
R10	1-216-646-11	METAL FILM CHIP 620 0.5% 1/10W
R11	1-216-667-11	METAL FILM CHIP 4.7K 0.5% 1/10W
R12, 13	1-216-668-11	METAL FILM CHIP 5.1K 0.5% 1/10W
R14	1-216-041-00	METAL GLAZE CHIP 470 5% 1/10W <1>
	1-216-055-00	METAL GLAZE CHIP 1.8K 5% 1/10W <2>
R15, 16	1-216-049-00	METAL GLAZE CHIP 1K 5% 1/10W
R17	1-216-093-00	METAL GLAZE CHIP 68K 5% 1/10W
R18	1-216-083-00	METAL GLAZE CHIP 27K 5% 1/10W
R19, 20	1-216-651-11	METAL FILM CHIP 1K 0.5% 1/10W
R21	1-216-056-00	METAL GLAZE CHIP 2K 5% 1/10W
R22	1-216-049-00	METAL GLAZE CHIP 1K 5% 1/10W
R23	1-216-041-00	METAL GLAZE CHIP 470 5% 1/10W <1>
	1-216-055-00	METAL GLAZE CHIP 1.8K 5% 1/10W <2>
R24	1-216-049-00	METAL GLAZE CHIP 1K 5% 1/10W
R25	1-216-085-00	METAL GLAZE CHIP 33K 5% 1/10W
R26	1-216-075-00	METAL GLAZE CHIP 12K 5% 1/10W
R27	1-216-649-11	METAL FILM CHIP 820 0.5% 1/10W
R28	1-216-651-11	METAL FILM CHIP 1K 0.5% 1/10W
R29	1-216-056-00	METAL GLAZE CHIP 2K 5% 1/10W
R30	1-216-651-11	METAL FILM CHIP 1K 0.5% 1/10W
R31	1-216-655-11	METAL FILM CHIP 1.5K 0.5% 1/10W
R32	1-216-643-11	METAL FILM CHIP 470 0.5% 1/10W
R33	1-216-649-11	METAL FILM CHIP 820 0.5% 1/10W
R34	1-216-651-11	METAL FILM CHIP 1K 0.5% 1/10W
R35	1-216-041-00	METAL GLAZE CHIP 470 5% 1/10W <1>
	1-216-055-00	METAL GLAZE CHIP 1.8K 5% 1/10W <2>
R36, 37	1-216-049-00	METAL GLAZE CHIP 1K 5% 1/10W
R38, 39	1-216-097-00	METAL GLAZE CHIP 100K 5% 1/10W
R40	1-216-029-00	METAL GLAZE CHIP 150 5% 1/10W
R41-46	1-216-097-00	METAL GLAZE CHIP 100K 5% 1/10W
R47	1-216-673-11	METAL FILM CHIP 8.2K 0.5% 1/10W
R48	1-216-658-11	METAL FILM CHIP 2K 0.5% 1/10W
R49	1-216-673-11	METAL FILM CHIP 8.2K 0.5% 1/10W
R50	1-216-655-11	METAL FILM CHIP 1.5K 0.5% 1/10W
R51-54	1-216-077-00	METAL GLAZE CHIP 15K 5% 1/10W
R55	1-216-057-00	METAL GLAZE CHIP 2.2K 5% 1/10W
R56	1-216-059-00	METAL GLAZE CHIP 2.7K 5% 1/10W
R57, 58	1-216-081-00	METAL GLAZE CHIP 22K 5% 1/10W
R59	1-216-049-00	METAL GLAZE CHIP 1K 5% 1/10W
R60	1-216-097-00	METAL GLAZE CHIP 100K 5% 1/10W
R61	1-216-645-11	METAL FILM CHIP 560 0.5% 1/10W
R62	1-216-643-11	METAL FILM CHIP 470 0.5% 1/10W
R63-66	1-216-121-00	METAL GLAZE CHIP 1M 5% 1/10W
R67, 68	1-216-029-00	METAL GLAZE CHIP 150 5% 1/10W
R69	1-216-081-00	METAL GLAZE CHIP 22K 5% 1/10W
R70	1-216-103-00	METAL GLAZE CHIP 180K 5% 1/10W
R71	1-216-089-00	METAL GLAZE CHIP 47K 5% 1/10W
R72, 73	1-216-029-00	METAL GLAZE CHIP 150 5% 1/10W
R74	1-216-081-00	METAL GLAZE CHIP 22K 5% 1/10W
R75	1-216-103-00	METAL GLAZE CHIP 180K 5% 1/10W
R76	1-216-089-00	METAL GLAZE CHIP 47K 5% 1/10W
R77	1-216-029-00	METAL GLAZE CHIP 150 5% 1/10W
R78	1-216-081-00	METAL GLAZE CHIP 22K 5% 1/10W
R79	1-216-103-00	METAL GLAZE CHIP 180K 5% 1/10W
R80	1-216-089-00	METAL GLAZE CHIP 47K 5% 1/10W
RV2, 4	1-238-222-11	ADJ, METAL GLAZE 4.7K
RV5, 6	1-238-223-11	ADJ, METAL GLAZE 10K

Notes <1>: When P/N suffix of MD-61 PC board is 11.
<2>: When P/N suffix of MD-61 PC board is 12.

Ref No. or Q'ty	Parts No.	Description
C-2-7.	PR-122 Board	
	*A-7513-978-A	COMPLETE PCB, PR-122
10pcs	1-563-940-11	TERMINAL, SOLDERLESS
1pc	*1-568-599-11	HOUSING, CONNECTOR 10P
1pc	*1-568-604-11	PIN, LINE ANGLE (SIL) 7P
2pcs	*1-568-605-11	PIN, LINE ANGLE (SIL) 9P
1pc	*1-943-978-11	HARNESS (TG-PR)
C1	1-163-038-00	CERAMIC CHIP 0.1 25V
C2, 3	1-135-166-21	TANTAL. CHIP 47 10% 10V
C4, 5	1-135-177-21	TANTAL. CHIP 1 10% 25V
C6	1-135-155-21	TANTAL. CHIP 4.7 10% 16V
C7	1-135-157-21	TANTAL. CHIP 10 10% 6.3V
C8	1-135-161-21	TANTAL. CHIP 22 10% 10V
C9	1-164-222-11	CERAMIC CHIP 0.22 25V
C10	1-135-177-21	TANTAL. CHIP 1 10% 25V
C11	1-135-161-21	TANTAL. CHIP 22 10% 10V
C12	1-135-157-21	TANTAL. CHIP 10 10% 6.3V
C13	1-135-161-21	TANTAL. CHIP 22 10% 10V
C14	1-163-088-00	CERAMIC CHIP 5pF 50V
C16-18	1-135-177-21	TANTAL. CHIP 1 10% 25V
C19	1-163-038-00	CERAMIC CHIP 0.1 25V
C20, 22	1-135-157-21	TANTAL. CHIP 10 10% 6.3V
C23	1-163-038-00	CERAMIC CHIP 0.1 25V
C24	1-135-166-21	TANTAL. CHIP 47 10% 10V
C25-27	1-163-093-00	CERAMIC CHIP 10pF 5% 50V
C28	1-135-157-21	TANTAL. CHIP 10 10% 6.3V
C29-34	1-163-038-00	CERAMIC CHIP 0.1 25V
C35, 36	1-135-177-21	TANTAL. CHIP 1 10% 25V
C37, 38	1-163-038-00	CERAMIC CHIP 0.1 25V
C39	1-135-157-21	TANTAL. CHIP 10 10% 6.3V
C40	1-163-121-00	CERAMIC CHIP 150pF 5% 50V
C41	1-163-125-00	CERAMIC CHIP 220pF 5% 50V
C42	1-163-241-11	CERAMIC CHIP 39pF 5% 50V
C43	1-163-121-00	CERAMIC CHIP 150pF 5% 50V
C44	1-163-125-00	CERAMIC CHIP 220pF 5% 50V
C45	1-163-241-11	CERAMIC CHIP 39pF 5% 50V
C46	1-163-121-00	CERAMIC CHIP 150pF 5% 50V
C47	1-163-125-00	CERAMIC CHIP 220pF 5% 50V
C48	1-163-241-11	CERAMIC CHIP 39pF 5% 50V
C49, 50	1-135-157-21	TANTAL. CHIP 10 10% 6.3V
C51-53	1-163-117-00	CERAMIC CHIP 100pF 5% 50V
C54	1-163-038-00	CERAMIC CHIP 0.1 25V
C55	1-135-157-21	TANTAL. CHIP 10 10% 6.3V
C56	1-135-177-21	TANTAL. CHIP 1 10% 25V
C57	1-135-157-21	TANTAL. CHIP 10 10% 6.3V
CN1	1-566-426-11	2P
D1, 2	8-719-400-18	MA152WK
IC1	8-752-034-67	CXA1337Q-Z
IC2	8-752-034-70	CXA1339Q-Z
IC3	8-759-011-62	MC74HC4051F
L1	1-410-693-21	CHIP 1
L2	1-410-713-31	CHIP 47
Q1	8-729-271-22	2SC2712-G
Q2	8-729-216-22	2SA1162
Q3, 5	8-729-271-22	2SC2712-G
Q6	8-729-216-22	2SA1162
Q7	8-729-271-22	2SC2712-G
Q8	8-729-216-22	2SA1162
Q9	8-729-271-22	2SC2712-G
Q10	8-729-216-22	2SA1162
Q11	8-729-271-22	2SC2712-G
Q12	8-729-216-22	2SA1162
Q13	8-729-271-22	2SC2712-G
Q14-16	8-729-216-22	2SA1162
Q17-20	8-729-271-22	2SC2712-G
R1, 2	1-216-097-00	METAL GLAZE CHIP 100K 5% 1/10W
R3	1-216-049-00	METAL GLAZE CHIP 1K 5% 1/10W
R4	1-216-059-00	METAL GLAZE CHIP 2.7K 5% 1/10W
R5	1-216-057-00	METAL GLAZE CHIP 2.2K 5% 1/10W
R6	1-216-065-00	METAL GLAZE CHIP 4.7K 5% 1/10W
R7	1-216-055-00	METAL GLAZE CHIP 1.8K 5% 1/10W
R8	1-216-057-00	METAL GLAZE CHIP 2.2K 5% 1/10W
R9	1-216-025-00	METAL GLAZE CHIP 100 5% 1/10W
R10	1-216-097-00	METAL GLAZE CHIP 100K 5% 1/10W
R13	1-216-065-00	METAL GLAZE CHIP 4.7K 5% 1/10W
R14	1-216-073-00	METAL GLAZE CHIP 10K 5% 1/10W
R15	1-216-089-00	METAL GLAZE CHIP 47K 5% 1/10W
R16	1-216-091-00	METAL GLAZE CHIP 56K 5% 1/10W
R17	1-216-081-00	METAL GLAZE CHIP 22K 5% 1/10W
R18-20	1-216-066-00	METAL GLAZE CHIP 5.1K 5% 1/10W
R21-23	1-216-049-00	METAL GLAZE CHIP 1K 5% 1/10W
R24	1-216-121-00	METAL GLAZE CHIP 1M 5% 1/10W
R25	1-216-748-11	METAL GLAZE CHIP 39K 1% 1/10W
R26	1-216-081-00	METAL GLAZE CHIP 22K 5% 1/10W
R27, 28	1-216-073-00	METAL GLAZE CHIP 10K 5% 1/10W
R29	1-216-047-00	METAL GLAZE CHIP 820 5% 1/10W
R30, 37	1-216-081-00	METAL GLAZE CHIP 22K 5% 1/10W
R38	1-216-075-00	METAL GLAZE CHIP 12K 5% 1/10W
R39-41	1-216-073-00	METAL GLAZE CHIP 10K 5% 1/10W
R42	1-216-085-00	METAL GLAZE CHIP 33K 5% 1/10W
R43	1-216-075-00	METAL GLAZE CHIP 12K 5% 1/10W
R44, 45	1-216-066-00	METAL GLAZE CHIP 5.1K 5% 1/10W
R46-48	1-216-049-00	METAL GLAZE CHIP 1K 5% 1/10W
R49, 50	1-216-073-00	METAL GLAZE CHIP 10K 5% 1/10W
R51-53	1-216-049-00	METAL GLAZE CHIP 1K 5% 1/10W
R54, 55	1-216-073-00	METAL GLAZE CHIP 10K 5% 1/10W
R56-58	1-216-049-00	METAL GLAZE CHIP 1K 5% 1/10W
R59, 60	1-216-073-00	METAL GLAZE CHIP 10K 5% 1/10W
R61	1-216-295-00	METAL GLAZE CHIP 0 5% 1/10W
R63	1-216-073-00	METAL GLAZE CHIP 10K 5% 1/10W
R68-70	1-216-073-00	METAL GLAZE CHIP 10K 5% 1/10W
R71	1-216-049-00	METAL GLAZE CHIP 1K 5% 1/10W
R72, 74	1-216-081-00	METAL GLAZE CHIP 22K 5% 1/10W
R75	1-216-089-00	METAL GLAZE CHIP 47K 5% 1/10W
R76	1-216-097-00	METAL GLAZE CHIP 100K 5% 1/10W
R77	1-216-073-00	METAL GLAZE CHIP 10K 5% 1/10W
R78	1-216-097-00	METAL GLAZE CHIP 100K 5% 1/10W
R79	1-216-081-00	METAL GLAZE CHIP 22K 5% 1/10W
R82-84	1-216-073-00	METAL GLAZE CHIP 10K 5% 1/10W
RV2	1-230-868-11	ADJ, METAL GLAZE 2.2K
RV5-10	1-230-873-11	ADJ, METAL GLAZE 47K
RV12, 14	1-230-870-11	ADJ, METAL GLAZE 10K
RV15-17	1-230-873-11	ADJ, METAL GLAZE 47K
SW1	1-571-980-11	DIGITAL (ROTARY)

XC-711 (UCJ)
XC-711P (EK)

C-2-8. RD-14 Board

Ref No. or Q'ty	Parts No.	Description
	*A-7513-979-A	COMPLETE PCB, RD-14
1pc	*1-568-600-11	PIN, LINE ANGLE (SIL) 3P
1pc	*1-568-601-11	PIN, LINE ANGLE (SIL) 4P
1pc	*1-568-603-11	PIN, LINE ANGLE (SIL) 6P
C1	1-135-161-21	TANTAL. CHIP 22 10% 10V
C2	1-135-161-21	TANTAL. CHIP 22 10% 10V
C3	1-135-155-21	TANTAL. CHIP 4.7 10% 16V
C4	1-163-038-00	CERAMIC CHIP 0.1 25V
C5	1-164-222-11	CERAMIC CHIP 0.22 25V
C6	1-163-038-00	CERAMIC CHIP 0.1 25V
C7	1-135-177-21	TANTAL. CHIP 1 10% 25V
C8	1-135-177-21	TANTAL. CHIP 1 10% 25V
C9	1-135-177-21	TANTAL. CHIP 1 10% 25V
C10	1-135-157-21	TANTAL. CHIP 10 10% 6.3V
C11	1-135-157-21	TANTAL. CHIP 10 10% 6.3V
C12	1-135-157-21	TANTAL. CHIP 10 10% 6.3V
C13	1-135-161-21	TANTAL. CHIP 22 10% 10V
C14	1-135-161-21	TANTAL. CHIP 22 10% 10V
C15	1-135-157-21	TANTAL. CHIP 10 10% 6.3V
C16	1-135-157-21	TANTAL. CHIP 10 10% 6.3V
C17	1-135-157-21	TANTAL. CHIP 10 10% 6.3V
C18	1-163-038-00	CERAMIC CHIP 0.1 25V
C19	1-164-222-11	CERAMIC CHIP 0.22 25V
C20	1-163-038-00	CERAMIC CHIP 0.1 25V
C21	1-135-177-21	TANTAL. CHIP 1 10% 25V
C22	1-135-177-21	TANTAL. CHIP 1 10% 25V
C23	1-135-177-21	TANTAL. CHIP 1 10% 25V
C24	1-135-157-21	TANTAL. CHIP 10 10% 6.3V
C25	1-135-157-21	TANTAL. CHIP 10 10% 6.3V
C26	1-135-157-21	TANTAL. CHIP 10 10% 6.3V
C27	1-135-157-21	TANTAL. CHIP 10 10% 6.3V
C28	1-135-157-21	TANTAL. CHIP 10 10% 6.3V
C29	1-135-157-21	TANTAL. CHIP 10 10% 6.3V
C30	1-163-038-00	CERAMIC CHIP 0.1 25V
C31	1-164-222-11	CERAMIC CHIP 0.22 25V
C32	1-163-038-00	CERAMIC CHIP 0.1 25V
C33	1-135-177-21	TANTAL. CHIP 1 10% 25V
C34	1-135-177-21	TANTAL. CHIP 1 10% 25V
C35	1-135-177-21	TANTAL. CHIP 1 10% 25V
C36	1-135-157-21	TANTAL. CHIP 10 10% 6.3V
C37	1-163-093-00	CERAMIC CHIP 10pF 5% 50V
C38	1-163-093-00	CERAMIC CHIP 10pF 5% 50V
C39	1-163-093-00	CERAMIC CHIP 10pF 5% 50V
C41	1-163-093-00	CERAMIC CHIP 10pF 5% 50V
C42	1-163-093-00	CERAMIC CHIP 10pF 5% 50V
C43	1-163-093-00	CERAMIC CHIP 10pF 5% 50V
D1	8-719-800-76	1SS123
D2	8-719-800-76	1SS123
DL1	1-415-688-11	DELAY LINE (Y-DL)
DL2	1-415-688-11	DELAY LINE (Y-DL)
DL3	1-415-688-11	DELAY LINE (Y-DL)
IC1	8-752-031-97	CXA1072Q-Z
IC2	8-752-031-97	CXA1072Q-Z
IC3	8-752-031-97	CXA1072Q-Z
IC4	8-759-983-10	MAX452CSA (Board suffix:-11)
	8-759-057-40	MC14577BF (Board suffix:-12)
IC5	8-759-983-10	MAX452CSA (Board suffix:-11)
	8-759-057-40	MC14577BF (Board suffix:-12)
IC6	8-759-983-10	MAX452CSA (Board suffix:-11)
	8-759-057-40	MC14577BF (Board suffix:-12)
L1	1-410-693-21	CHIP 1
L2	1-410-693-21	CHIP 1
Q1	8-729-271-22	2SC2712-G
Q2	8-729-271-22	2SC2712-G
Q3	8-729-271-22	2SC2712-G
Q4	8-729-216-22	2SA1162
Q5	8-729-216-22	2SA1162
R1	1-216-748-11	METAL GLAZE CHIP 39K 1% 1/10W
R2	1-216-093-00	METAL GLAZE CHIP 68K 5% 1/10W
R3	1-216-077-00	METAL GLAZE CHIP 15K 5% 1/10W
R4	1-216-077-00	METAL GLAZE CHIP 15K 5% 1/10W
R5	1-216-083-00	METAL GLAZE CHIP 27K 5% 1/10W
R6	1-216-073-00	METAL GLAZE CHIP 10K 5% 1/10W
R7	1-216-073-00	METAL GLAZE CHIP 10K 5% 1/10W
R8	1-216-295-00	METAL GLAZE CHIP 0 5% 1/10W
R9	1-216-295-00	METAL GLAZE CHIP 0 5% 1/10W
R10	1-216-295-00	METAL GLAZE CHIP 0 5% 1/10W
R11	1-216-049-00	METAL GLAZE CHIP 1K 5% 1/10W
R12	1-216-073-00	METAL GLAZE CHIP 10K 5% 1/10W
R13	1-216-053-00	METAL GLAZE CHIP 1.5K 5% 1/10W
R14	1-216-049-00	METAL GLAZE CHIP 1K 5% 1/10W
R15	1-216-022-00	METAL GLAZE CHIP 75 5% 1/10W
R16	1-216-075-00	METAL GLAZE CHIP 12K 5% 1/10W
R17	1-216-057-00	METAL GLAZE CHIP 2.2K 5% 1/10W
R18	1-216-073-00	METAL GLAZE CHIP 10K 5% 1/10W
R19	1-216-057-00	METAL GLAZE CHIP 2.2K 5% 1/10W
R20	1-216-053-00	METAL GLAZE CHIP 1.5K 5% 1/10W
R21	1-216-049-00	METAL GLAZE CHIP 1K 5% 1/10W
R22	1-216-022-00	METAL GLAZE CHIP 75 5% 1/10W
R23	1-216-083-00	METAL GLAZE CHIP 27K 5% 1/10W
R29	1-216-053-00	METAL GLAZE CHIP 1.5K 5% 1/10W
R30	1-216-049-00	METAL GLAZE CHIP 1K 5% 1/10W
R31	1-216-022-00	METAL GLAZE CHIP 75 5% 1/10W
R41	1-216-021-00	METAL GLAZE CHIP 68 5% 1/10W
R42	1-216-083-00	METAL GLAZE CHIP 27K 5% 1/10W
R43	1-216-097-00	METAL GLAZE CHIP 100K 5% 1/10W
R44	1-216-097-00	METAL GLAZE CHIP 100K 5% 1/10W
R45	1-216-097-00	METAL GLAZE CHIP 100K 5% 1/10W
R46	1-216-097-00	METAL GLAZE CHIP 100K 5% 1/10W
R47	1-216-081-00	METAL GLAZE CHIP 22K 5% 1/10W
RV1	1-230-873-11	ADJ, METAL GLAZE 47K
RV2	1-230-873-11	ADJ, METAL GLAZE 47K
RV3	1-230-873-11	ADJ, METAL GLAZE 47K
RV4	1-230-873-11	ADJ, METAL GLAZE 47K
RV5	1-230-873-11	ADJ, METAL GLAZE 47K
RV6	1-230-873-11	ADJ, METAL GLAZE 47K
RV7	1-230-873-11	ADJ, METAL GLAZE 47K
RV8	1-230-873-11	ADJ, METAL GLAZE 47K
RV9	1-230-873-11	ADJ, METAL GLAZE 47K
RV10	1-230-873-11	ADJ, METAL GLAZE 47K
RV11	1-230-873-11	ADJ, METAL GLAZE 47K
RV12	1-230-873-11	ADJ, METAL GLAZE 47K

C-2-9. TG-48 Board

Ref No. or Q'ty	Parts No.	Description	Note
	*A-7513-975-A	COMPLETE PCB, TG-48	<N>
	*A-7513-981-A	COMPLETE PCB, TG-48P	<P>
1pc	*1-568-604-11	PIN, LINE ANGLE (SIL) 7P	
2pcs	*1-568-605-11	PIN, LINE ANGLE (SIL) 9P	
C1	1-135-148-21	TANTAL. CHIP 1.5 10% 16V	
C2, 3	1-135-161-21	TANTAL. CHIP 22 10% 10V	
C4	1-163-117-00	CERAMIC CHIP 100pF 5% 50V	
C5	1-135-148-21	TANTAL. CHIP 1.5 10% 16V	
C6-8	1-163-093-00	CERAMIC CHIP 10pF 5% 50V	
C9	1-163-232-11	CERAMIC CHIP 0.01 10% 100V	
C10	1-135-148-21	TANTAL. CHIP 1.5 10% 16V	
C11-14	1-163-109-00	CERAMIC CHIP 47pF 5% 50V	
C15, 16	1-163-101-00	CERAMIC CHIP 22pF 5% 50V	
C17	1-135-148-21	TANTAL. CHIP 1.5 10% 16V	
C18, 19	1-163-109-00	CERAMIC CHIP 47pF 5% 50V	
C20	1-163-093-00	CERAMIC CHIP 10pF 5% 50V	
C21, 22	1-131-350-00	TANTALUM 3.3 10% 35V	<1>
	1-135-154-21	TANTAL. CHIP 3.3 10% 20V	<2>
C23	1-135-148-21	TANTAL. CHIP 1.5 10% 16V	
C24	1-163-232-11	CERAMIC CHIP 0.01 10% 100V	
C25	1-135-157-21	TANTAL. CHIP 10 10% 6.3V	
C26	1-135-148-21	TANTAL. CHIP 1.5 10% 16V	
C27, 28	1-163-232-11	CERAMIC CHIP 0.01 10% 100V	
C29-31	1-163-093-00	CERAMIC CHIP 10pF 5% 50V	
C32	1-163-105-00	CERAMIC CHIP 33pF 5% 50V	
C33	1-163-232-11	CERAMIC CHIP 0.01 10% 100V	
C34	1-163-093-00	CERAMIC CHIP 10pF 5% 50V	
C35	1-163-101-00	CERAMIC CHIP 22pF 5% 50V	<3>
C36	1-135-161-21	TANTAL. CHIP 22 10% 10V	
C37	1-135-148-21	TANTAL. CHIP 1.5 10% 16V	
C38	1-135-157-21	TANTAL. CHIP 10 10% 6.3V	
C39	1-163-232-11	CERAMIC CHIP 0.01 10% 100V	
C40	1-135-157-21	TANTAL. CHIP 10 10% 6.3V	
C41	1-163-035-00	CERAMIC CHIP 0.047 50V	
C42	1-163-033-00	CERAMIC CHIP 0.022 50V	
C43, 44	1-163-109-00	CERAMIC CHIP 47pF 5% 50V	
C45	1-163-009-11	CERAMIC CHIP 0.001 10% 50V	
C46	1-163-109-00	CERAMIC CHIP 47pF 5% 50V	
CN1	*1-568-598-11	10P	
CV1	1-141-412-11	TRIMMER 20pF	
D1	8-719-907-19	VARICAP FC52M-5	
IC2	8-752-326-69	CXD1035BQ-Z	
IC3	8-759-008-45	MC74HC4538F	
IC4	8-759-941-40	CXD1084Q-W	
IC5	8-759-032-01	MC74HC00AF	
IC6	8-759-009-02	MC14046BF	
L1-3	1-410-709-31	CHIP 22	
L4	1-410-196-11	CHIP 2.2	
L5	1-410-501-11	MICRO 2.2	

Ref No.	Parts No.	Description	Note
Q1	8-729-216-22	2SA1162	
R1-6	1-216-073-00	METAL GLAZE CHIP 10K 5% 1/10W	
R7, 8	1-249-429-11	CARBON 10K 5% 1/4W	<1>
	1-216-073-00	METAL GLAZE CHIP 10K 5% 1/10W	<2>
R14	1-216-073-00	METAL GLAZE CHIP 10K 5% 1/10W	
R15	1-216-073-00	METAL GLAZE CHIP 10K 5% 1/10W	<P>
R18	1-216-073-00	METAL GLAZE CHIP 10K 5% 1/10W	<N>
R21, 22	1-216-073-00	METAL GLAZE CHIP 10K 5% 1/10W	
R23	1-216-073-00	METAL GLAZE CHIP 10K 5% 1/10W	<N>
R24	1-216-073-00	METAL GLAZE CHIP 10K 5% 1/10W	<P>
R25	1-216-049-00	METAL GLAZE CHIP 1K 5% 1/10W	
R28-32	1-216-057-00	METAL GLAZE CHIP 2.2K 5% 1/10W	
R33	1-216-121-00	METAL GLAZE CHIP 1M 5% 1/10W	
R34	1-216-073-00	METAL GLAZE CHIP 10K 5% 1/10W	
R35	1-216-089-00	METAL GLAZE CHIP 47K 5% 1/10W	
R36	1-216-073-00	METAL GLAZE CHIP 10K 5% 1/10W	
R37	1-216-065-00	METAL GLAZE CHIP 4.7K 5% 1/10W	
R38	1-216-057-00	METAL GLAZE CHIP 2.2K 5% 1/10W	
R39	1-216-049-00	METAL GLAZE CHIP 1K 5% 1/10W	
R40	1-216-080-00	METAL GLAZE CHIP 20K 5% 1/10W	
R41, 42	1-216-057-00	METAL GLAZE CHIP 2.2K 5% 1/10W	
R43	1-216-113-00	METAL GLAZE CHIP 470K 5% 1/10W	
R44	1-216-119-00	METAL GLAZE CHIP 820K 5% 1/10W	
R45	1-216-037-00	METAL GLAZE CHIP 330 5% 1/10W	
R46	1-216-041-00	METAL GLAZE CHIP 470 5% 1/10W	
R47	1-216-121-00	METAL GLAZE CHIP 1M 5% 1/10W	
R48	1-216-105-00	METAL GLAZE CHIP 220K 5% 1/10W	
R49	1-216-097-00	METAL GLAZE CHIP 100K 5% 1/10W	
R50	1-216-073-00	METAL GLAZE CHIP 10K 5% 1/10W	
R51	1-216-057-00	METAL GLAZE CHIP 2.2K 5% 1/10W	
R52-54	1-216-073-00	METAL GLAZE CHIP 10K 5% 1/10W	
R55	1-216-033-00	METAL GLAZE CHIP 220 5% 1/10W	
R56	1-216-049-00	METAL GLAZE CHIP 1K 5% 1/10W	
R57	1-216-017-00	METAL GLAZE CHIP 47 5% 1/10W	
R58	1-216-057-00	METAL GLAZE CHIP 2.2K 5% 1/10W	
R59	1-216-073-00	METAL GLAZE CHIP 10K 5% 1/10W	<N>
R60	1-216-049-00	METAL GLAZE CHIP 1K 5% 1/10W	<P>
X1	1-567-708-12	VIBRATOR, CRYSTAL 28.6363MHz	<N>
	1-567-732-12	VIBRATOR, CRYSTAL 28.375MHz	<P>

Notes <N>: For XC-711(UCJ)
<P>: For XC-711P(EK)
<1>: When P/N suffix of TG-48 PC board is 11.
<2>: When P/N suffix of TG-48 PC board is 12.
<3>: In case two capacitors are in place C19, this is to be only one of them.

Ref No. or Q'ty	Parts No.	Description
C-2-10. YC-38 Board		
	*A-7513-980-A	COMPLETE PCB, YC-38
1pc	*1-568-600-11	PIN, LINE, ANGLE (SIL) 3P
1pc	*1-568-604-11	PIN, LINE, ANGLE (SIL) 7P
C1	1-135-157-21	TANTAL. CHIP 10 10% 6.3V
C2	1-163-038-00	CERAMIC CHIP 0.1 25V
C3	1-163-093-00	CERAMIC CHIP 10pF 5% 50V
C4	1-163-038-00	CERAMIC CHIP 0.1 25V
C5	1-163-038-00	CERAMIC CHIP 0.1 25V
C6	1-163-093-00	CERAMIC CHIP 10pF 5% 50V
C7	1-163-038-00	CERAMIC CHIP 0.1 25V
C8	1-135-161-21	TANTAL. CHIP 22 10% 10V
C9	1-135-161-21	TANTAL. CHIP 22 10% 10V
C10	1-135-157-21	TANTAL. CHIP 10 10% 6.3V
D1	8-719-400-18	MA152WK
D2	8-719-400-18	MA152WK
IC1	8-759-983-10	MAX452CSA
IC2	8-759-983-10	MAX452CSA
IC3	8-759-011-63	MC74HC4051F
L1	1-410-693-21	CHIP 1
L2	1-410-693-21	CHIP 1
R1	1-216-097-00	METAL GLAZE CHIP 100K 5% 1/10W
R2	1-216-022-00	METAL GLAZE CHIP 75 5% 1/10W
R3	1-216-045-00	METAL GLAZE CHIP 680 5% 1/10W
R4	1-216-049-00	METAL GLAZE CHIP 1K 5% 1/10W
R5	1-216-097-00	METAL GLAZE CHIP 100K 5% 1/10W
R6	1-216-022-00	METAL GLAZE CHIP 75 5% 1/10W
R7	1-216-049-00	METAL GLAZE CHIP 1K 5% 1/10W
R9	1-216-049-00	METAL GLAZE CHIP 1K 5% 1/10W
R10	1-216-073-00	METAL GLAZE CHIP 10K 5% 1/10W
R11	1-216-073-00	METAL GLAZE CHIP 10K 5% 1/10W
R12	1-216-073-00	METAL GLAZE CHIP 10K 5% 1/10W
RV1	1-237-575-11	ADJ, METAL GLAZE 1K
RV2	1-237-575-11	ADJ, METAL GLAZE 1K
RV3	1-230-870-11	ADJ, METAL GLAZE 10K
RV4	1-230-870-11	ADJ, METAL GLAZE 10K
RV5	1-230-870-11	ADJ, METAL GLAZE 10K
RV6	1-230-870-11	ADJ, METAL GLAZE 10K
SW1	1-571-980-11	DIGITAL (ROTARY)

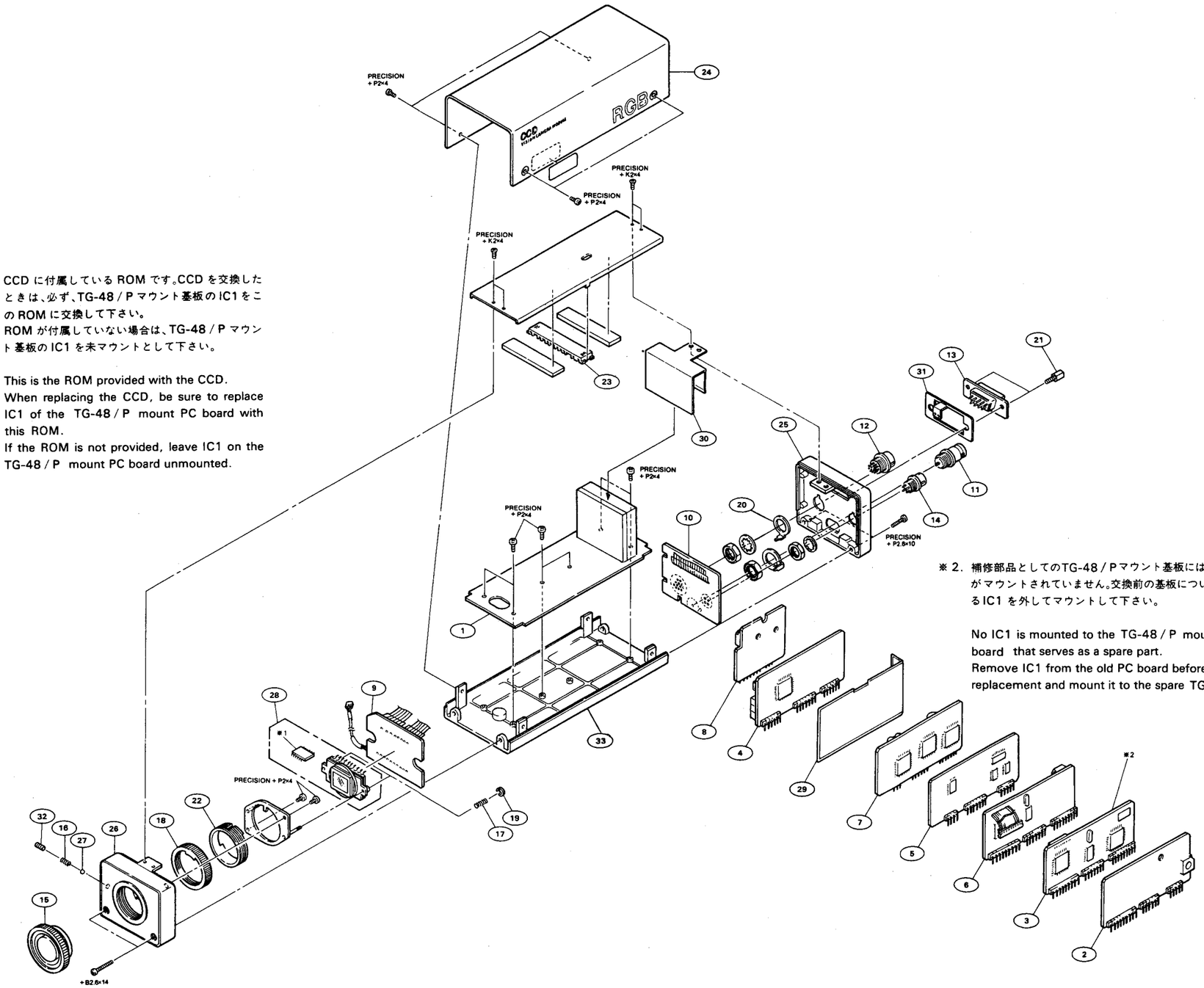
C-3. EXPLODED VIEW

No.	Parts No.	Description	<Note>
1	*A-7513-973-A	COMPLETE PCB, MB-222	
2	*A-7513-974-A	COMPLETE PCB, DR-83	
3	*A-7513-975-A	COMPLETE PCB, TG-48	<N>
	*A-7513-981-A	COMPLETE PCB, TG-48P	<P>
4	*A-7513-976-A	COMPLETE PCB, EN-72	<N>
	*A-7513-982-A	COMPLETE PCB, EN-72P	<P>
5	*A-7513-977-A	COMPLETE PCB, MD-61	
6	*A-7513-978-A	COMPLETE PCB, PR-122	
7	*A-7513-979-A	COMPLETE PCB, RD-14	
8	*A-7513-980-A	COMPLETE PCB, YC-38	
9	*A-7520-429-A	MOUNTED PCB, BI-26	
⚠10	*A-7520-430-A	MOUNTED PCB, CN-295	
11	1-562-382-00	CONNECTOR, BNC	
12	1-562-381-00	CONNECTOR, ROUND TYPE 12P	
13	1-563-890-21	SOCKET, D-SUB CONNECTOR 9P	
14	1-563-929-11	CONNECTOR, ROUND TYPE (RF) 4P	
15	2-042-385-00	CAP, C MOUNT	
16	3-563-463-00	SPRING, COMPRESSION	
17	*3-698-802-01	SPRING, COMPRESSION	
18	*3-698-814-01	RING, ADJUSTMENT	
19	3-698-829-01	NUT (M2)	<1>
	7-624-102-04	STOP RING 1.5, TYPE E	<2>
20	*3-718-804-01	LUG, GROUND	
21	*3-737-501-01	POST, HEXAGON	
22	*3-737-502-01	RING, SLIDE	
23	*3-737-506-03	RETAINER, PC BOARD	
24	*3-737-508-01	COVER	
25	*3-737-510-02	PANEL, REAR	
26	*3-737-511-02	PANEL, FRONT	
27	7-671-154-01	STENLESS BALL	
28	8-750-011-35	IU022AM-12A	<N>
	8-750-011-95	IU024AM-12A	<P>
29	*3-737-514-02	PLATE (1), SHIELD	
30	*3-737-515-02	PLATE (2), SHIELD	<1>
	*3-165-073-01	HEAT SINK	<2>
31	*3-737-536-01	LUG, GROUND, CONNECTOR	<2>
32	7-683-245-08	SET-SCT, HEX, 4x4, PLAT POINT	
33	*3-737-509-01	BASE	
	7-621-775-70	SCREW +B 2.6x14	
	7-627-452-28	SCREW, PRECISION +K 2.0x4.0	
	7-627-553-48	SCREW, PRECISION +P 2.0x4.0	
	7-627-557-48	SCREW, PRECISION +P 2.6x10	

Notes <N>: For XC-711(UCJ)
<P>: For XC-711P(EK)
<1>: XC-711(UCJ) S/N 10001 to 13500
XC-711P(EK) S/N 10001 to 11200
<2>: XC-711(UCJ) S/N 13501 and higher
XC-711P(EK) S/N 11201 and higher

※1. CCD に付属している ROM です。CCD を交換したときは、必ず、TG-48 / P マウント基板の IC1 をこの ROM に交換して下さい。
ROM が付属していない場合は、TG-48 / P マウント基板の IC1 を未マウントとして下さい。

This is the ROM provided with the CCD.
When replacing the CCD, be sure to replace IC1 of the TG-48 / P mount PC board with this ROM.
If the ROM is not provided, leave IC1 on the TG-48 / P mount PC board unmounted.

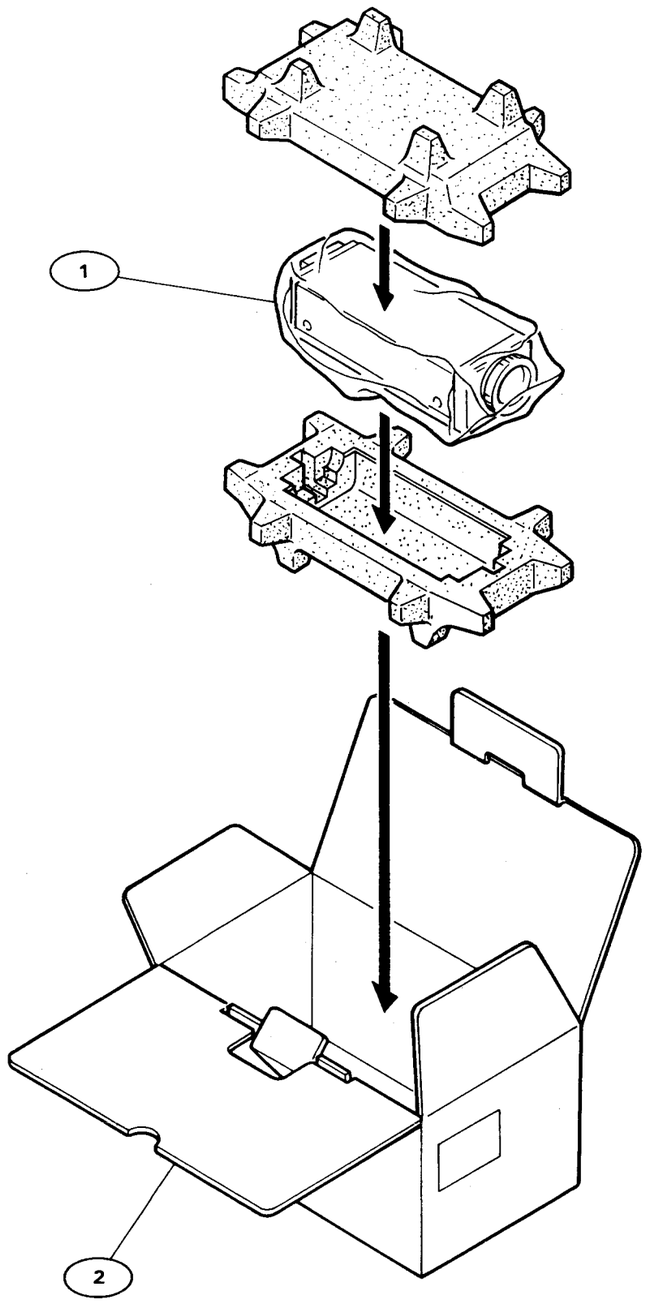


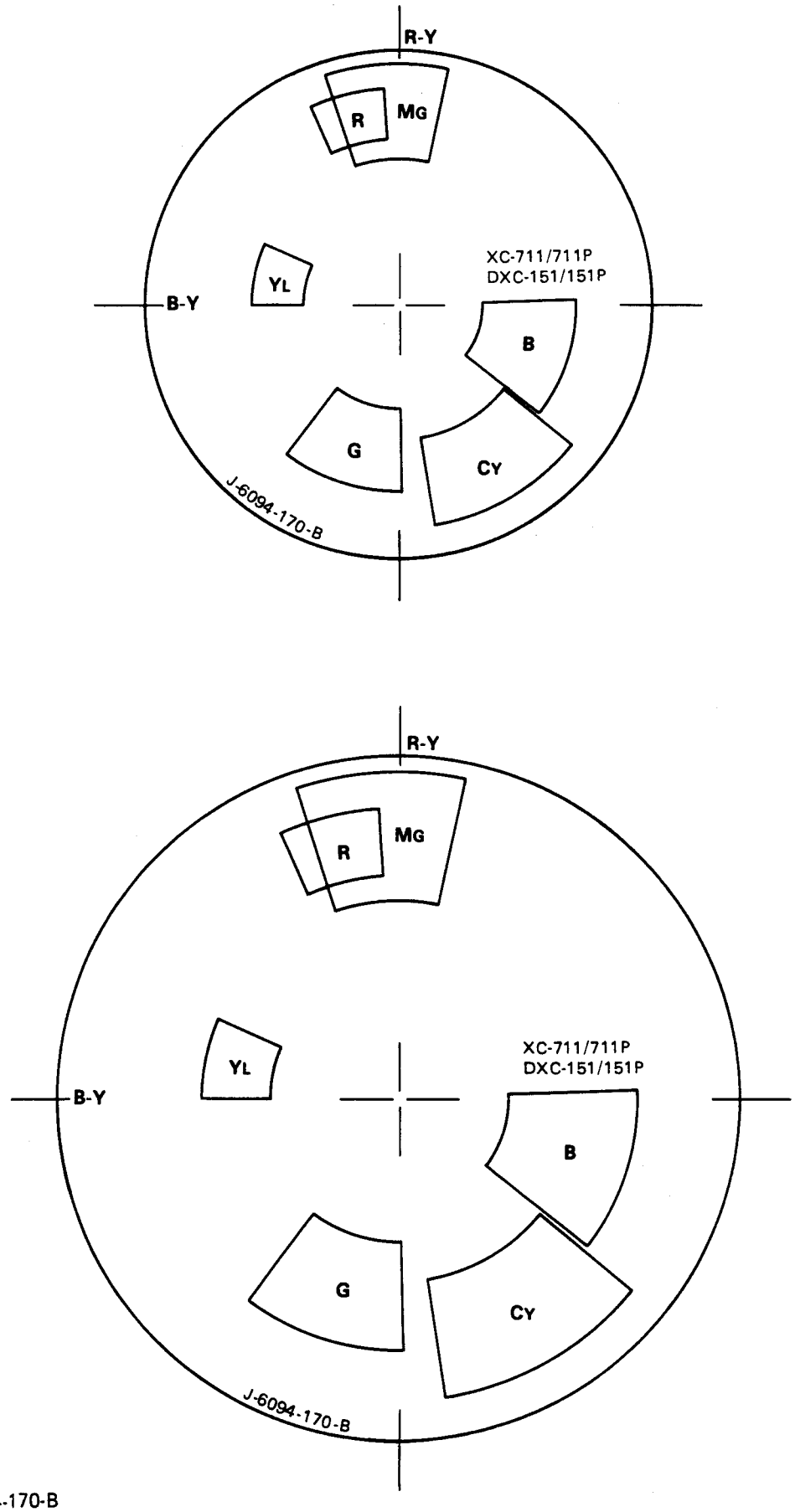
※2. 補修部品としてのTG-48 / Pマウント基板には、IC1がマウントされていません。交換前の基板についているIC1 を外してマウントして下さい。

No IC1 is mounted to the TG-48 / P mount board that serves as a spare part.
Remove IC1 from the old PC board before replacement and mount it to the spare TG-48 / P.

C-4. PACKING MATERIAL

No.	Parts No.	Description
1	3-701-626-00	BAG, POLYETHYLENE
2	*3-737-519-01	INDIVIDUAL CARTON (XC-711 UCJ)
	*3-737-520-01	INDIVIDUAL CARTON (XC-711P EK)




R-Y
R
MG
YL
B-Y
XC-711/711P
DXC-151/151P
B
G
CY
J-6094-170-B
R-Y
R
MG
YL
B-Y
XC-711/711P
DXC-151/151P
B
G
CY
J-6094-170-B

J-6094-170-B